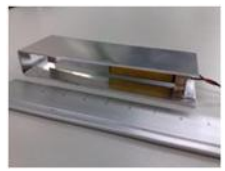
Micromechatronics products

Innovator in Electronics

Cooling Solution

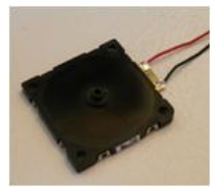
- Active Cooling
  - Motor -fan

  - muRata 村田製作所 Piezo Fan



ES: Now, MP:2011/Q1~

  - muRata 村田製作所 Microblower



ES: Now, MP:2010/Q3~

- Passive Cooling
  - Natural Convection

Application of Micromechatronics Products

muRata
Innovator in Electronics

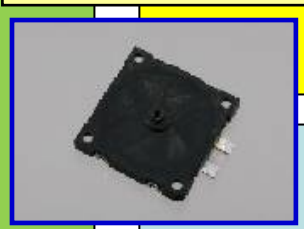
Next Generation Energy System

Fuel Cell

DMFC

(Direct methanol Fuel Cell)

Microblower



Air Pump application

Air Fresh

Toys/Game, etc

Air Cooling Device

Small/Mobile Equipment

Micro Projector

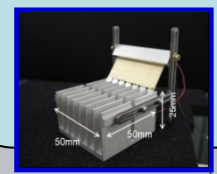
Security Camera

LED Lightning

CPU

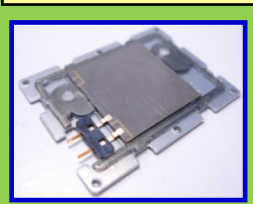
NETTOP PC
NETBOOK

Piezo Fan



Microvalve

Micropump



Profile of Microblower

P/N: MZB1001T**

<Market trend and needs>

Thermal technology is increasing its importance, especially in small/compact electronic equipments. Customers are looking for a smaller cooling device than DC fan.

Gas Sensor

(ex. Reflow Checker)

◆**Feature**

- Small and thin (20×20×1.8mm)
- High output pressure (≧1kPa)
- Low power consumption

◆**Application**

-**Air cooler** for compact equipments such as DVC, DSC, and UMPC, etc

-**Air pump** for Fuel Cell, Gas Sensor, Ionizer, Fragrance, etc.

LED Cooling

(ex. Micro-projector)

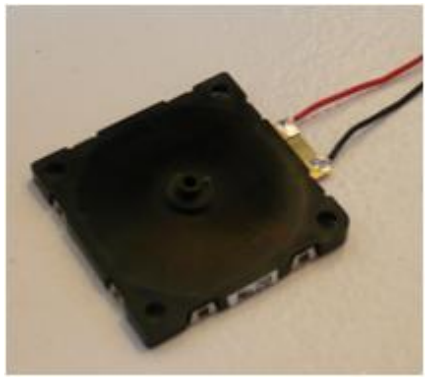
PC Cooling

(ex. Net Top Book)

Air Cooling & Air pump

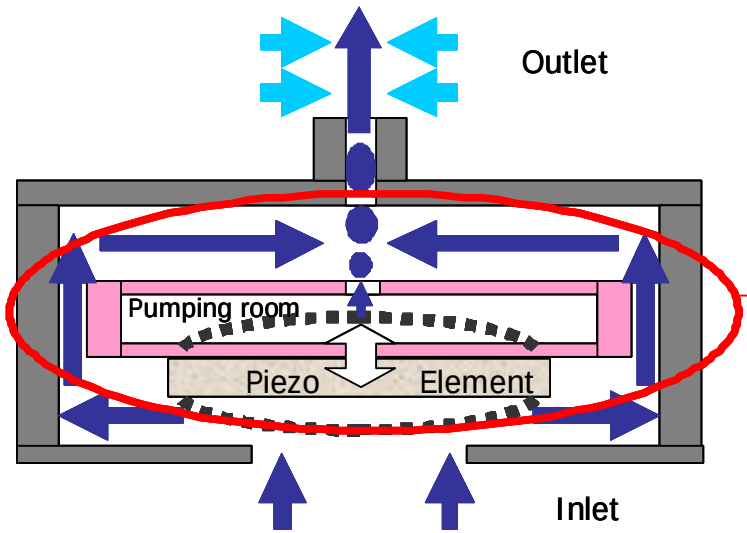
Microblower Technology

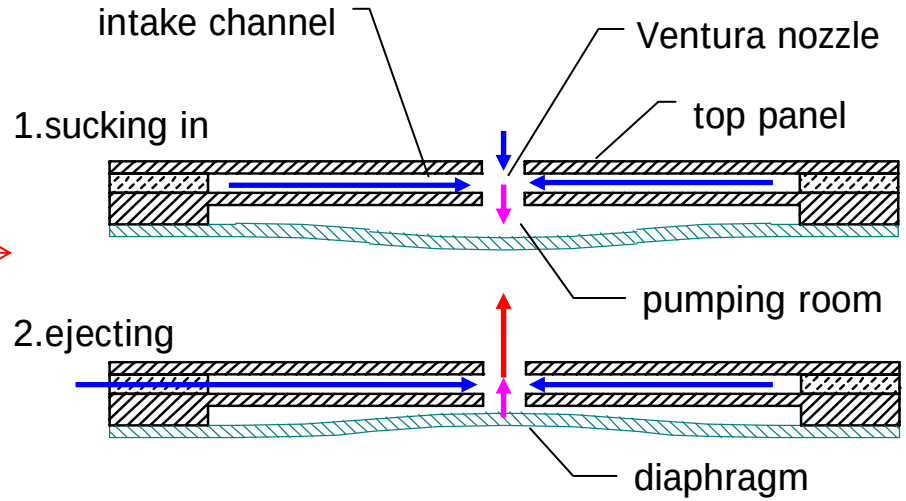
Feature of Microblower



Item	Specification
Driving Frequency	25KHz
Air flow	0.8l/min(@15Vpp)
Static pressure	**1.5kPa**
Size (Excl Nozzle Height)	**20x20x1.85mm** **(Nozzle Height 1.6mm**

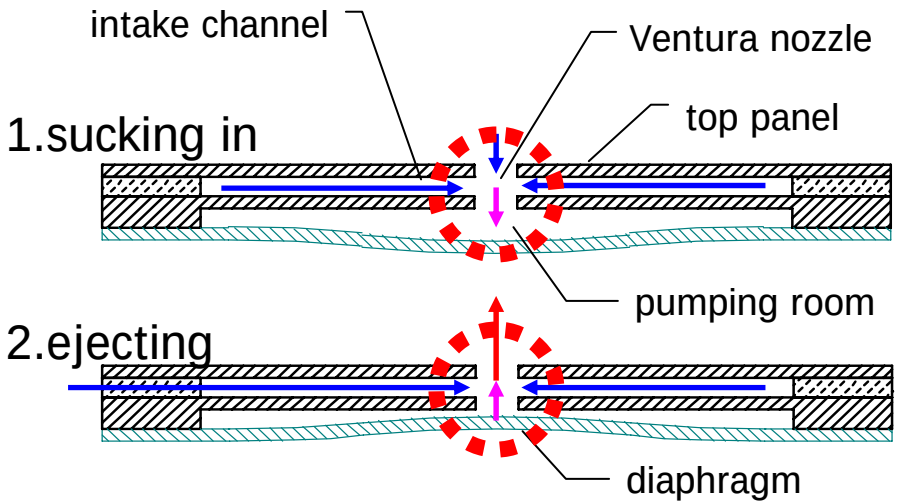
Air flow





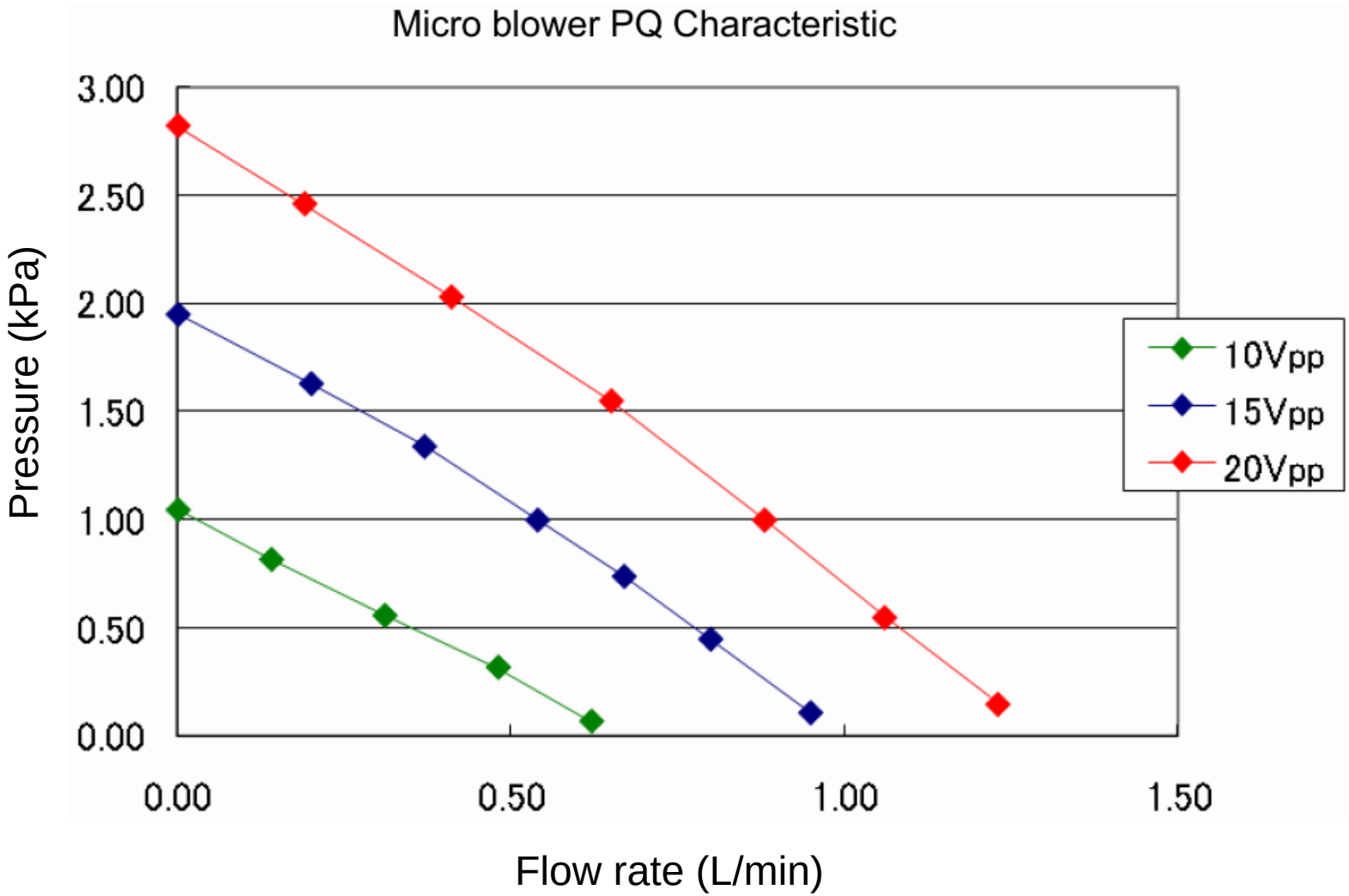
Principle of operation

Air flow with high velocity generates lower pressure to suck air around, which makes real net flow (Bernouilli's theorem)

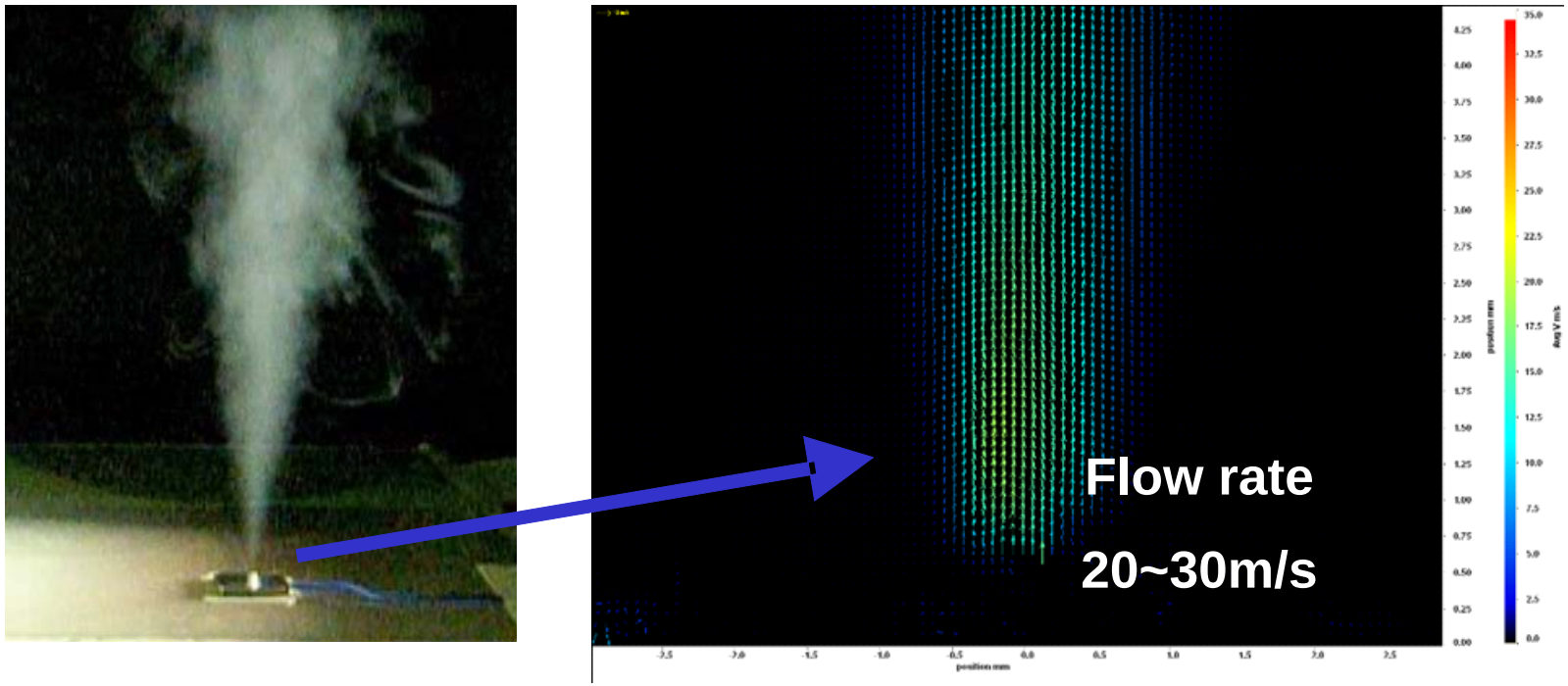


High velocity -> Low pressure -> Suck air around -> Push out to outlet

P-Q Characteristics



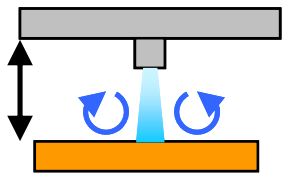
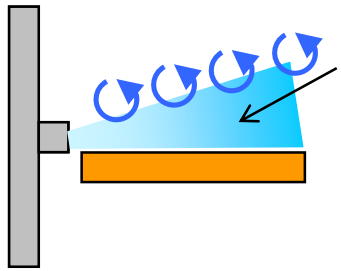
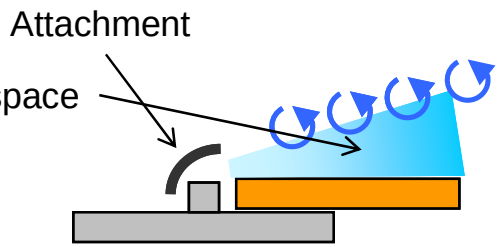
Features



High Pressure ：Air Pump, Cooling Narrow pitch Mounting

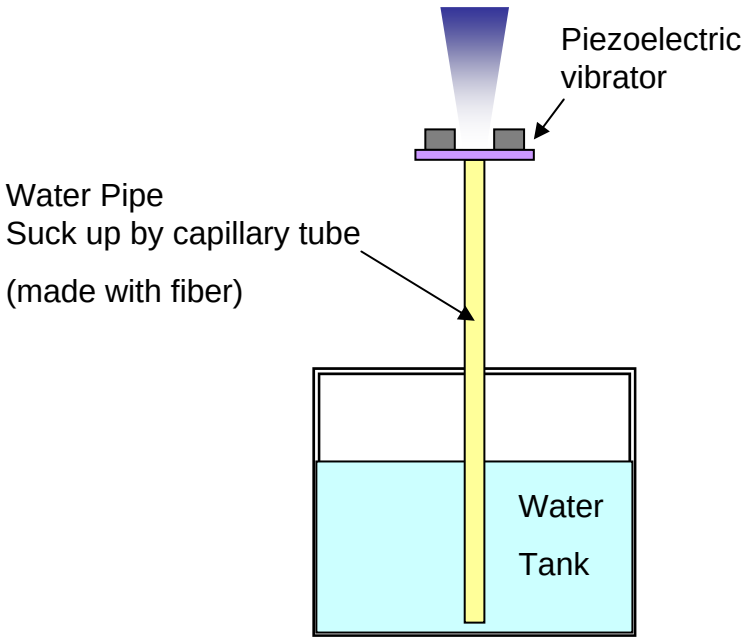
High Flow Rate ：Local cooling, Diffusion

Cooling methods

Vertical	Horizontal -1	Horizontal -2
		
- Minimizing mounting area - Certain distance is necessary to enhance cooling performance. (Cooling only by the amount of flowing from the blower if the distance is too close)	- Cooling effect is enhanced if there is some space above a material. - Effect of increasing Net amount of flowing. - Making thermal boundary thinner owing to flowing speed. - Not so adequate for low profile mounting.	-Cooling effect is enhanced if there is some space above a material. - Lower profile mounting is possible. - Attachment is necessary.

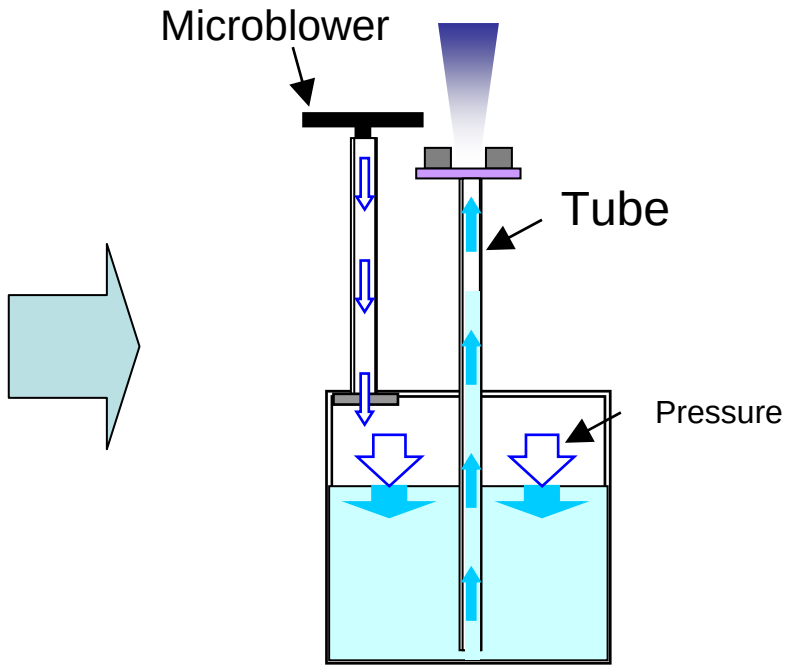
Application of Microblower

Current



Water supply is not stable due to capillary effect

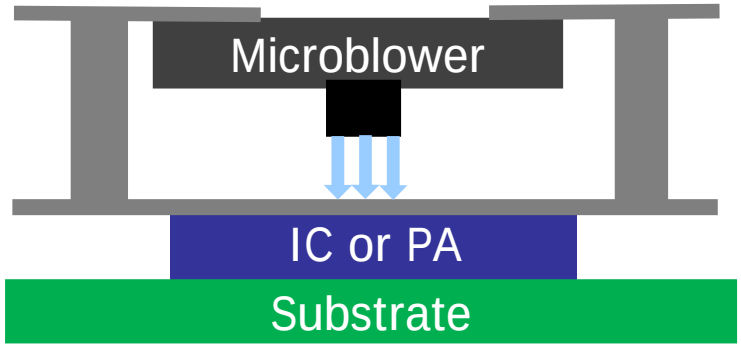
New Method w/ Microblower

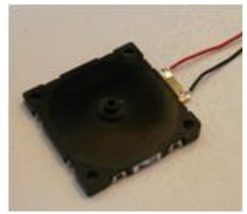


Water supply is stable and quick start can be achieved.

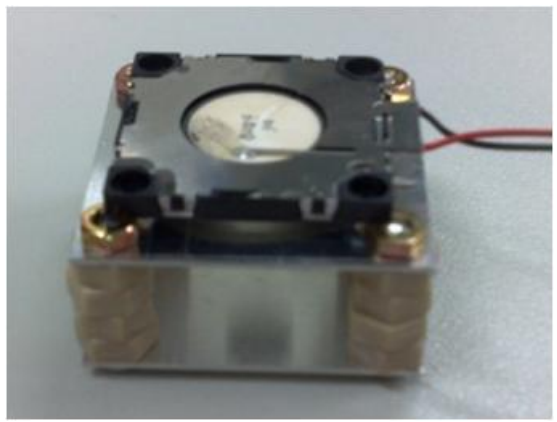
Spot Cooling for PA/IC with Microblower

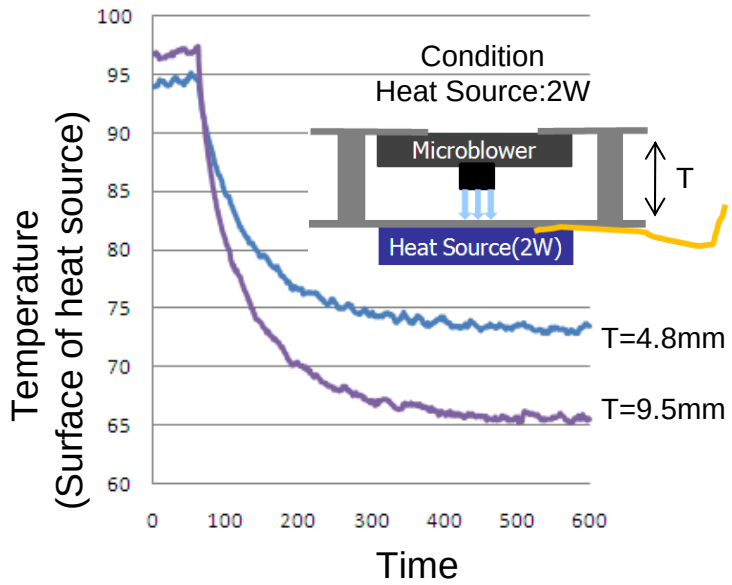
- Piezo Microblower



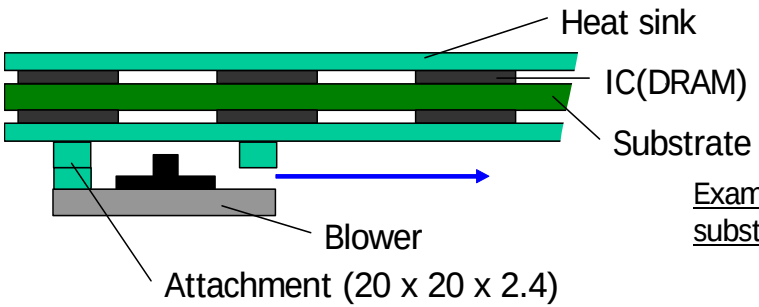


20.0x20.0x1.65mm

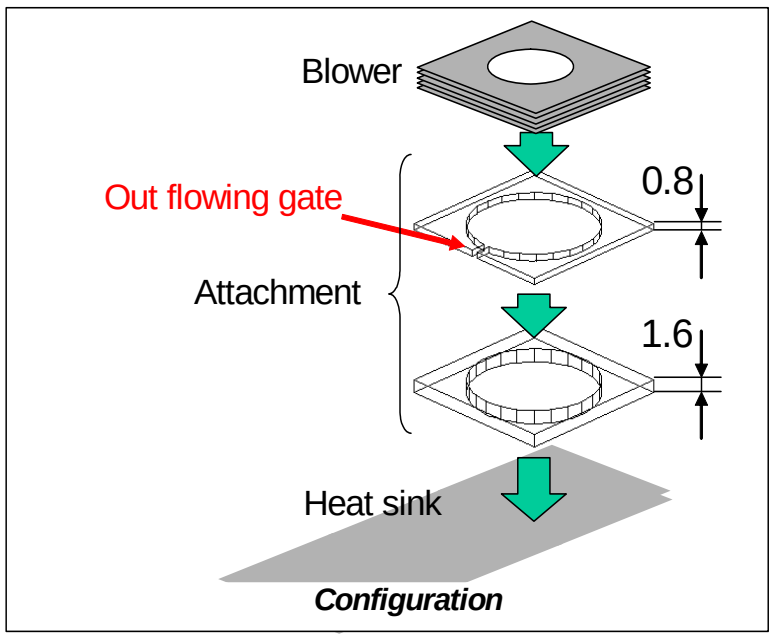




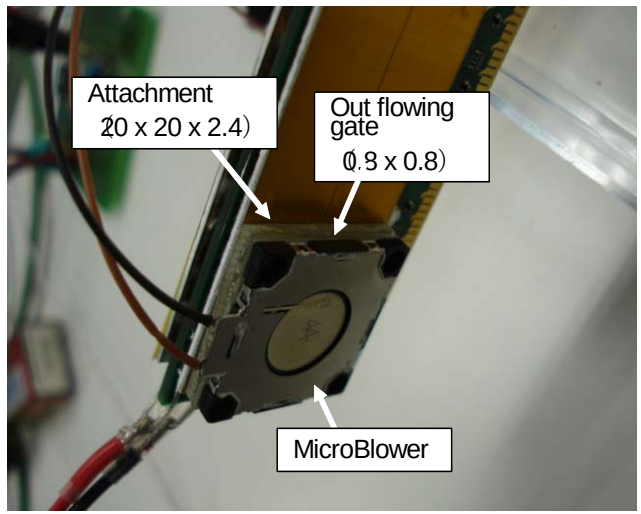
Example of (Cooling Memory Module)



Example of the method to make flowing direction toward a substrate using minimum thickness of attachment.



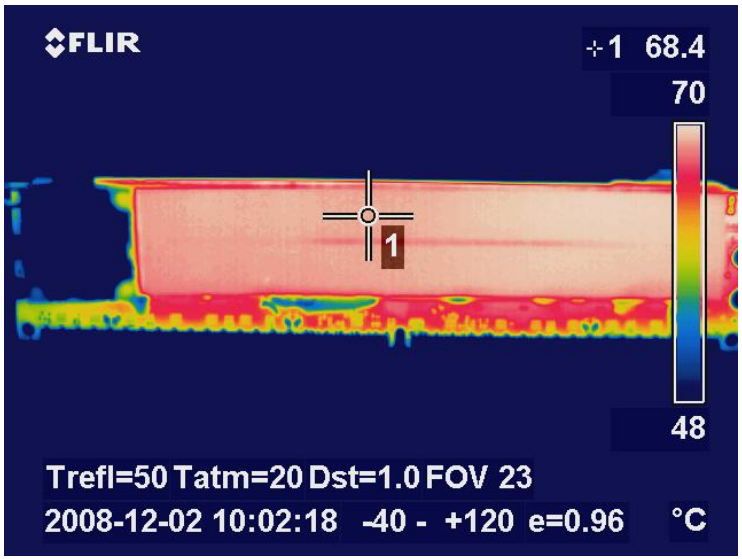
Configuration



Blower and attachment

Test Result

Power: 6.8W



Thermal temp. of surface of Heat sink

(Before blower operation)

-17K lower

Thermal temp. of surface of heat sink

(Blower is under operation)

Thermal resistance

Rhs=6.3[K/W]

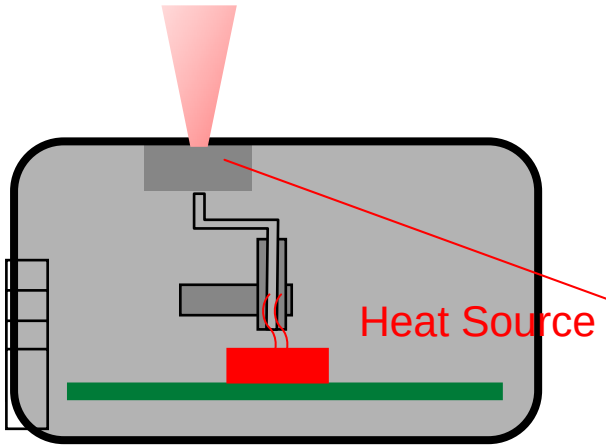
↓

Rhs=3.8[K/W]

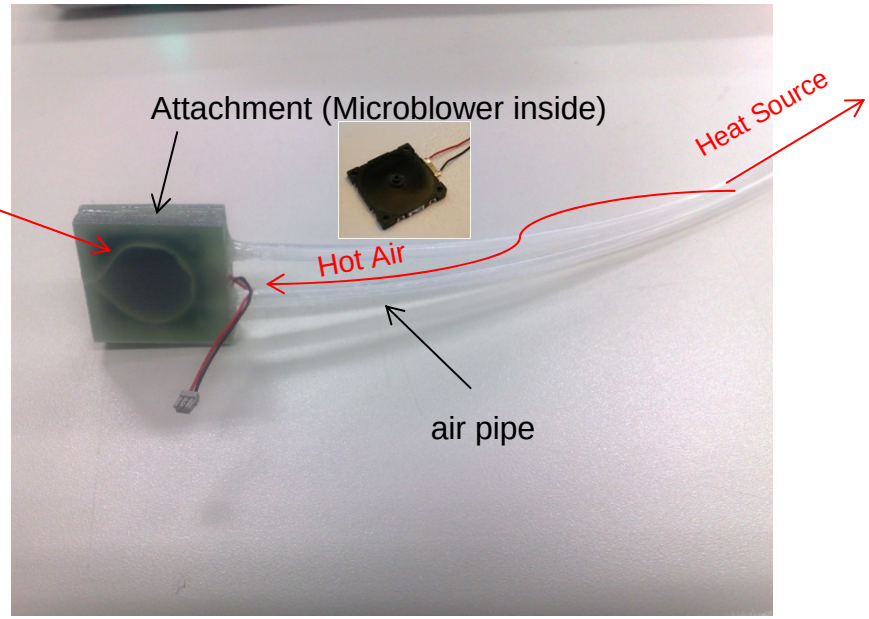
40% lower

We can see around 17k temp. lower in open space

Aspiration of hot air

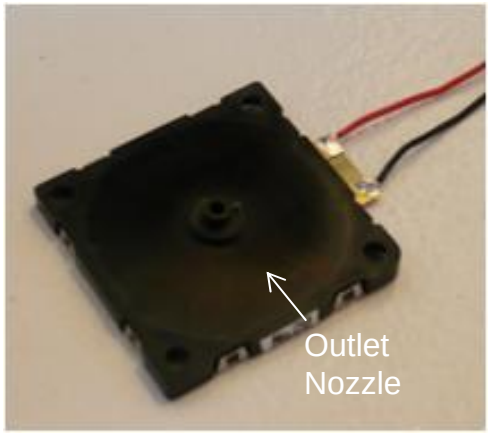


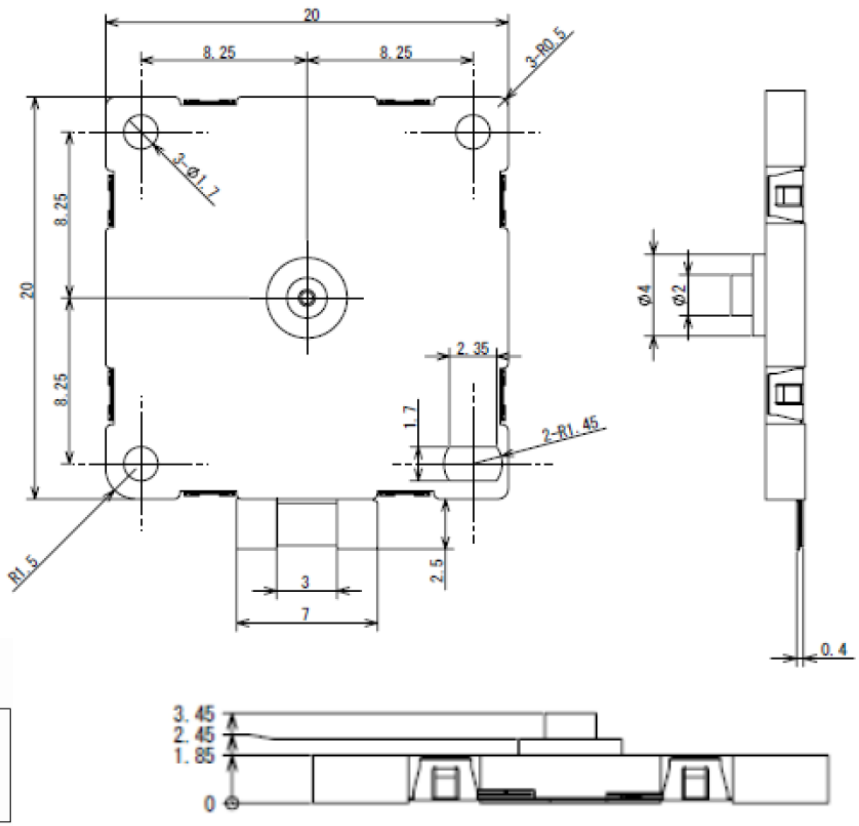
Aspiration of hot air from deep area to cool down

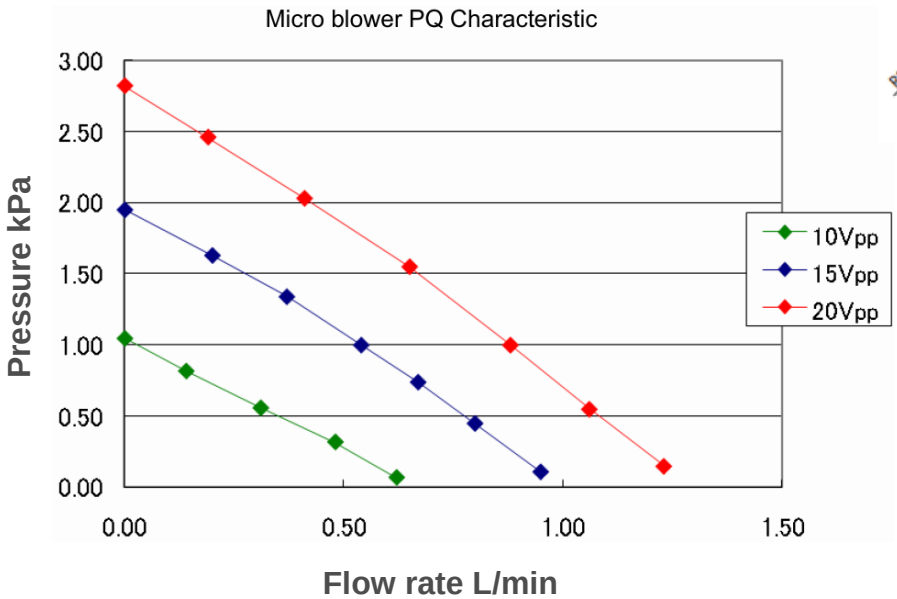


Example : handmade attachment (Microblower +air pipe)

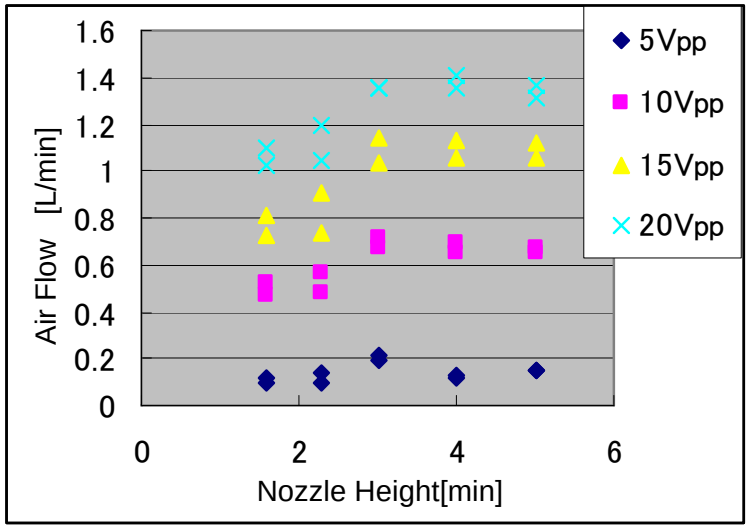
Appearance of Microblower

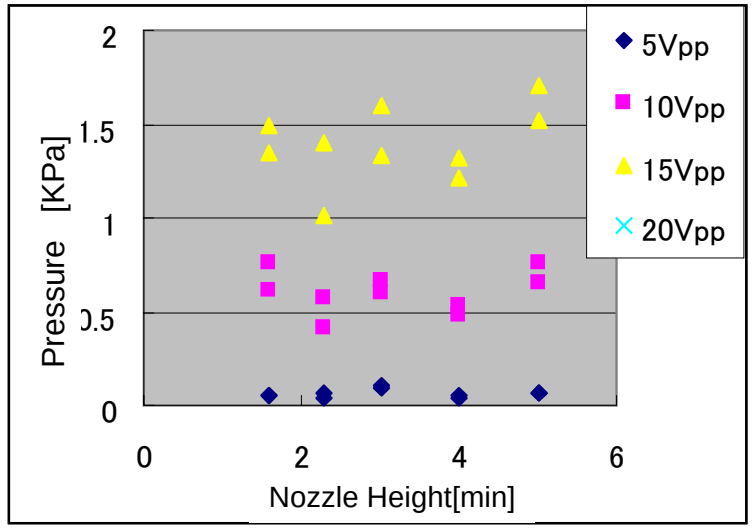


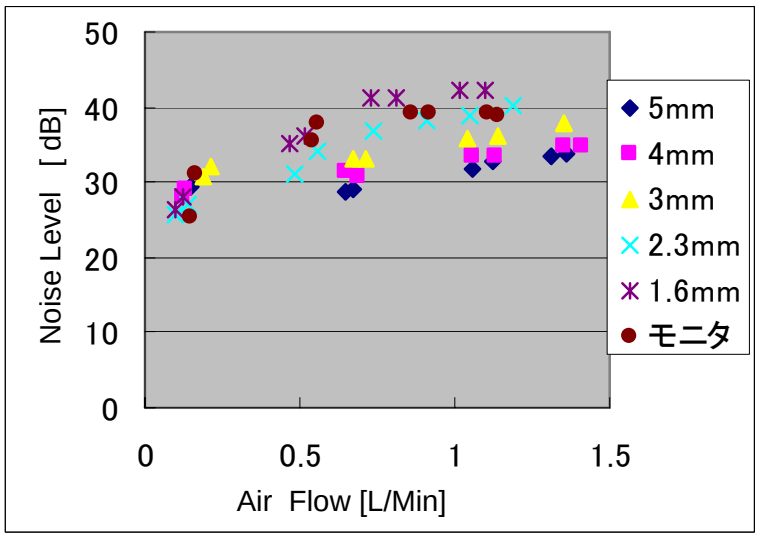




Test Result







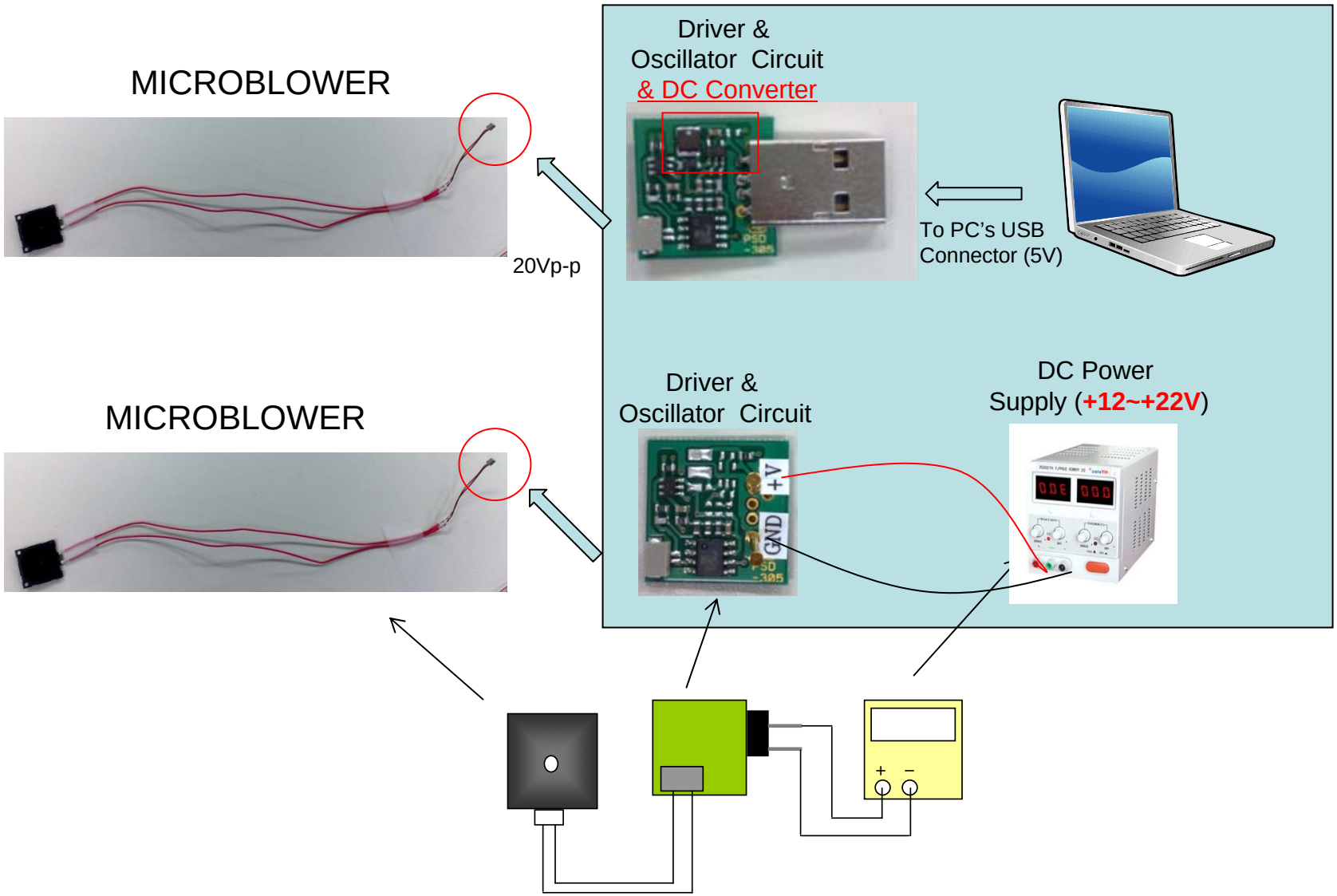
MICROBLOWER Driver

MICROBLOWER's Driver Board

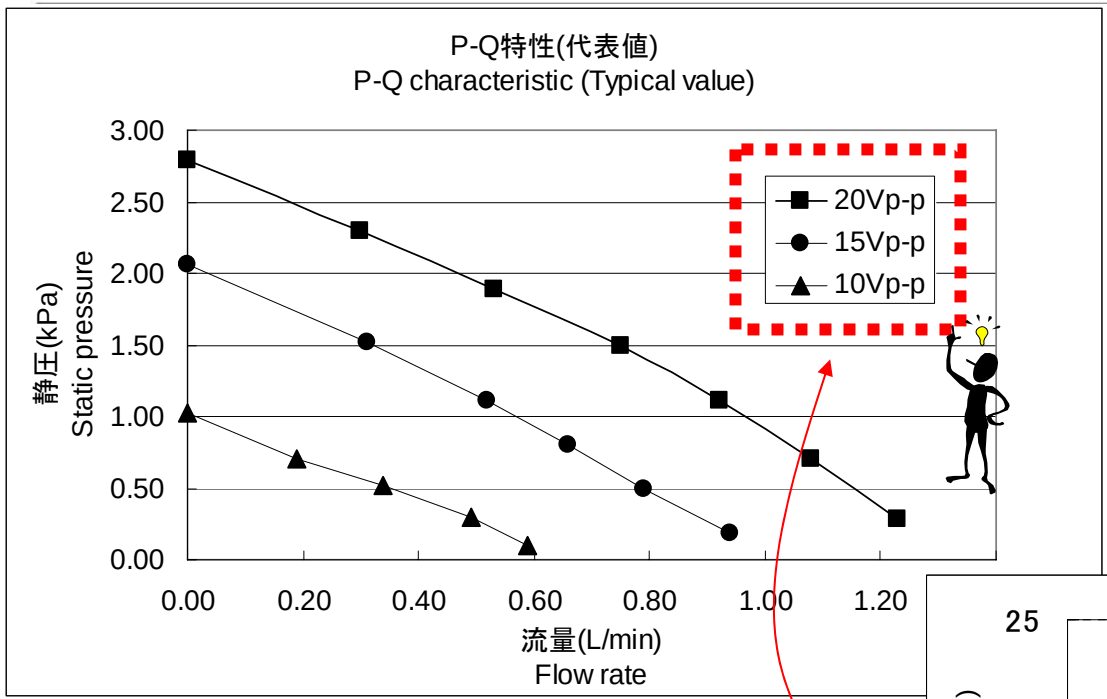
Control Board Type1　　Control Board Type2(USB　Type）

P/N:MZBD001
Note: only for evaluation purpose
(we don’t have this product in mass-production.)

MICROBLOWER Sample (How to connect)

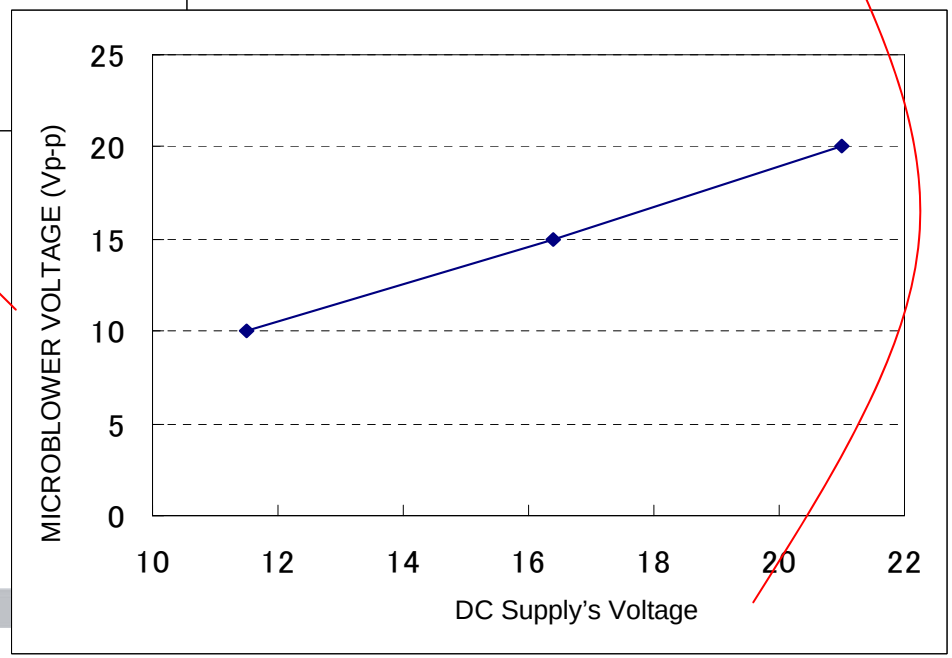


MICROBLOWER Sample (How to apply voltage)

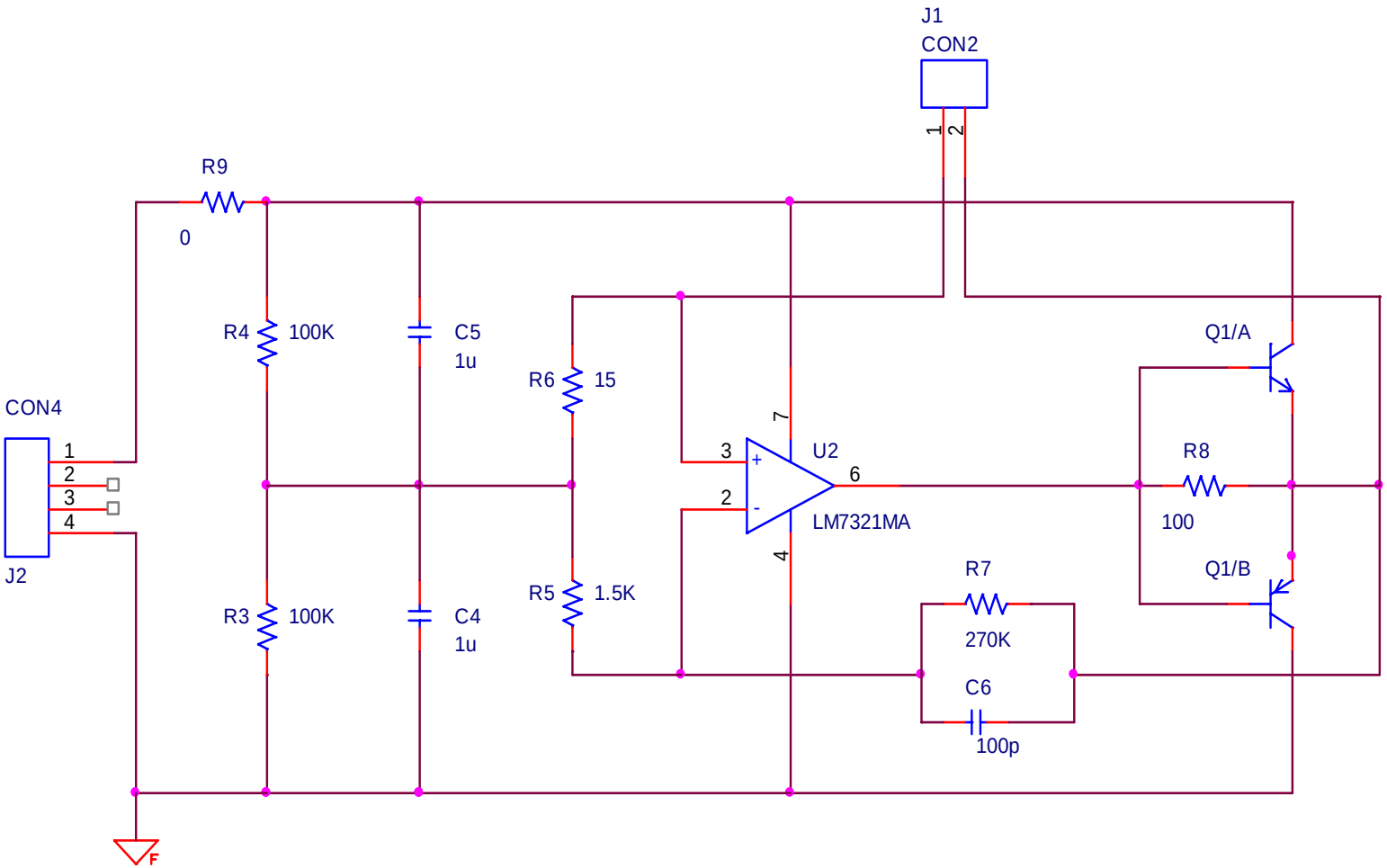


Driver &
Oscillator Circuit

DC Power
Supply (12~22V)



Driver Circuit (Type1)

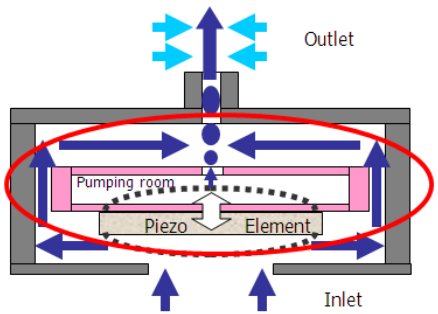


Driver Part List

U2	Op Amp	LM7321MA	National Semiconnductor	GBW=20MHz Railto Rail IN/OUT
Q1	Transister(PNP/NPN)	HN1B04F	Toshiba Semiconductor	Ic=500mA
R3,R4	Chip Resistor 100kΩ	RK73B1JTTD104J	KOA	0.1W
R5	Chip Resistor 1.5kΩ	RK73B1JTTD152J	KOA	0.1W
R6	Chip Resistor 15Ω	RK73B1JTTD150J	KOA	0.1W
R7	Chip Resistor 270KΩ	RK73B1JTTD274J	KOA	0.1W
R8	Chip Resistor 100Ω	RK73B1JTTD101J	KOA	0.1W
R9	Short Chip	RK73Z1JTTD	KOA	
C4,C5	Chip Capacitor 1μF	GRM188R71E105KA12D	MURATA	25V X7R
C6	Chip Capacitor 100p	GRM1882C1H101JA01D	MURATA	50Vdc CH
J1	Connector	SM02B-SSR-H-TB	JST	
J2	USB Connector	317A	Chant Sincere	

Microblower Reliability Testing

On-going reliability



Amplitude ⇌ Apply Voltage

試験項目 Examination item	条件 Condition	結果 Result	試験状態 Status
高温放置 Dry heat (storage)	85℃	6000hr/G	継続中 Continue
高温駆動(CR内) Dry heat operating (in CR)	85℃20Vp-p	10000hr/G	継続中 Continue
湿中放置 High temperature and humidity	85℃85%	3000hr/G	5000時間で劣化 Degradation at 5000h
湿中駆動 High temperature and humidity operating	60℃93%20Vp-p	3000hr/G	完了 Finished
HCT Heat cycle test	-40℃⇔85℃	6000cyc/G	継続中 Continue
低温放置 Low temperature	-40℃	7000hr/G	継続中 Continue
圧力負荷試験 High temperature pressure driving test	85℃/20V	2000hr/G	完了 Finished
落下試験 Drop test	To 1.5m concrete 6directionx 3times	G	完了 Finished
衝撃試験 Shock test	1500G	G	完了 Finished
振動試験 Vibration test	98m/s2(10G)、max amplitude1.5mm 10～2kHz、Log sweep, 3dir・20min、12cycles	G	完了 Finished

※判定基準:初期値±10%　　G/NG judge： initial value ±10%　　Dec.2010

=> 15000hr by now

Expected failure mode: Crack of piezo-element (Fatigue breakdown)

END