

## Transducer / Buzzer Measurement

### • Sound Pressure and Distance

As there are differences in the measuring distances when manufacturers make the measurement of sound pressure, the following formula is recommended for calculation upon occasion when a buzzer is tested or compared with a planned final product.

However, as far as the calculated value is concerned, it is a theoretical one and therefore subject to change, depending on circumstances and conditions.

The formula is :  $B = A + 20\text{Log}(L_a/L_b)$

A : sound pressure level at distance  $L_a$

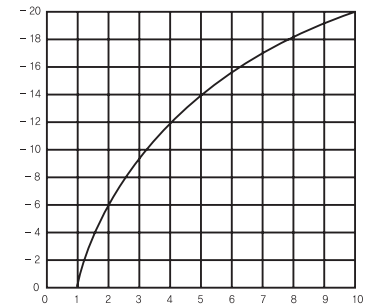
B : sound pressure level at distance  $L_b$

For example, when the distance is doubled,

$$B = A + 20\text{Log}(L_a/L_b) = A + 20\text{Log}(1/2) = A + 6.02$$

That is, the sound pressure is inclined to be reduced by 6.02dB. The table below is to show relations between the measuring distance and sound pressure variation for the reference

Measuring distance variation	Sound pressure variation(dB)
2 times	-6.02
3 times	-9.54
4 times	-13.56
6 times	-15.56
7 times	-16.90
8 times	-18.06
9 times	-19.08
10times	-20.00



### • Design Method of Device Resonator Housing

The following formula is basic analysis, Helmholtz resonator to increase sound pressure.

$$f_v = \frac{CD}{4} \sqrt{\frac{1}{\pi V(L + 0.75D)}}$$

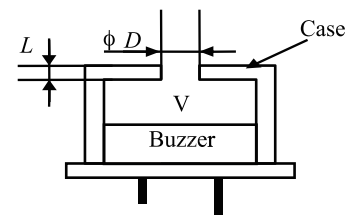
$f_v$  : Resonator's resonant frequency(Hz)

C : 344,000(mm/sec)

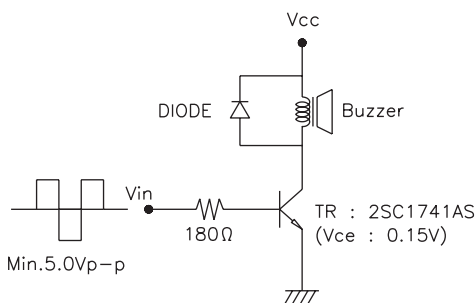
D : Inside diameter of sound emission hole(mm)

L : Thickness of sound emission hole side(mm)

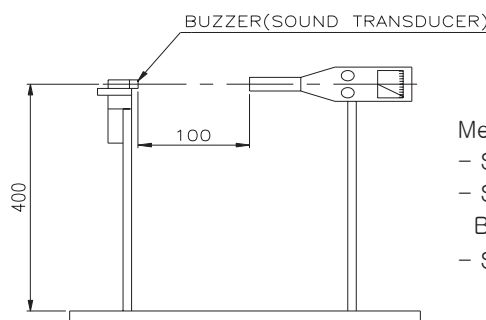
V : Resonator housing volume(sq. mm)



### • Standard Driver Circuit



### • Standard Test Fixture



Measurement Parts

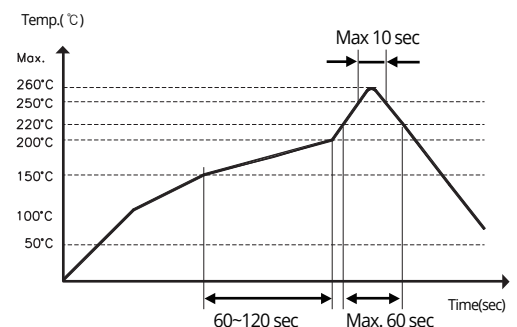
- Set 400 mm height
- Set 100 mm between Buzzer and SPL Meter
- Set weight : "Fast" / "A"

### • Soldering Condition

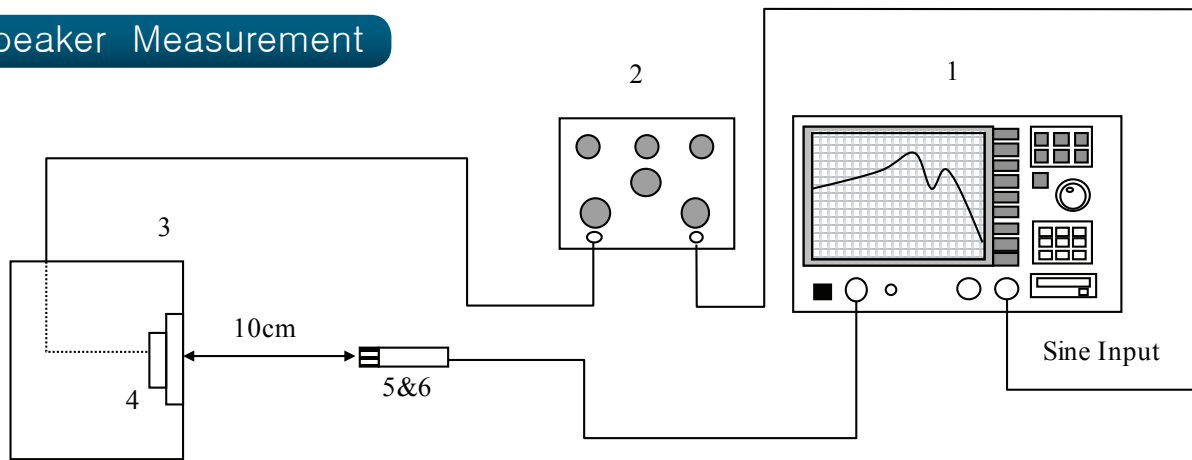
- Recommendable reflow soldering condition is as follows.

Note 1: It is requested that reflow soldering should be executed after heat of product goes down to normal temperature.

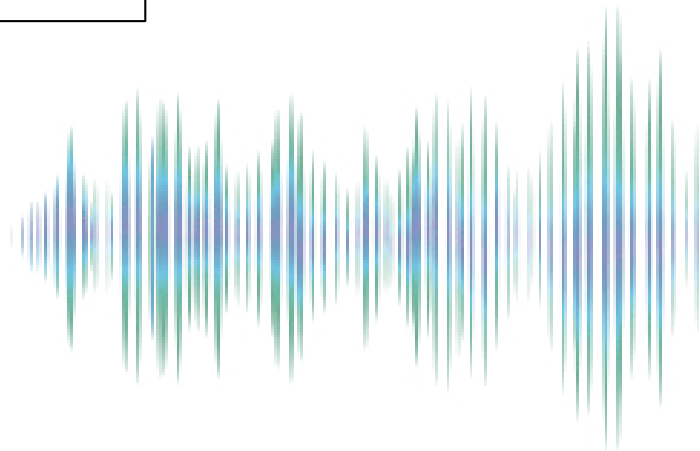
Note 2: Peak reflow temperature of 260 °C, with a maximum duration of 60 sec. between 220°C and 260°C



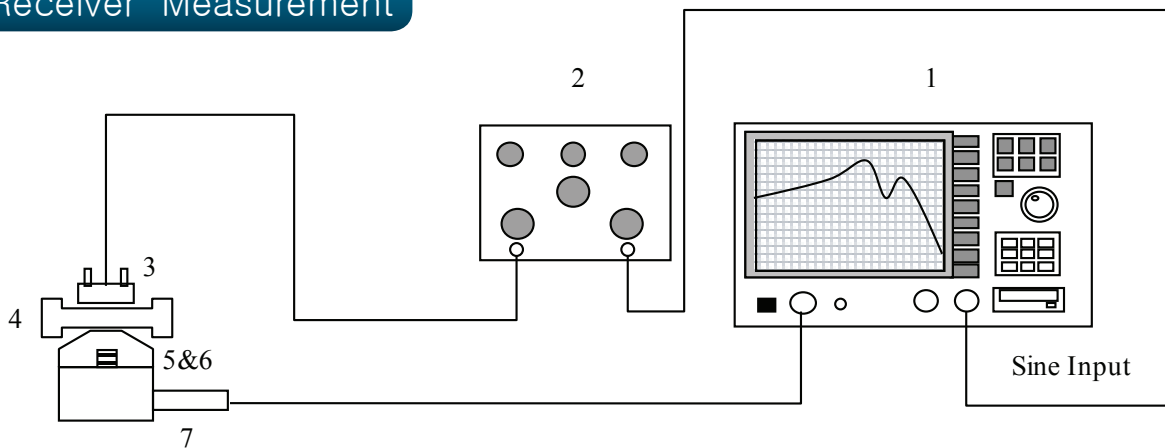
## Speaker Measurement



NO	EQUIPMENT	REMARKS
1	Audio Analyzer	B&K 2012
2	Preamplifier	LAM 300 2716-A
3	Baffle Box	HS Standard (1000 m <sup>2</sup> )
4	Dynamic Speaker	SPEAKER
5	MIC.	B&K 4192
6	MIC. PRE-AMP	B&K 2669



## Receiver Measurement



NO	EQUIPMENT	REMARKS
1	AUDIO ANALYZER	B&K 2012
2	PREAMPLIFIER	LAM 300 2716-A
3	DYNAMIC RECEIVER	RECEIVER
4	EARPIECE	HS STANDARD
5	COUPLER	B&K 4185
6	MIC.	B&K 4192
7	MIC. PRE-AMP	B&K 2669