

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

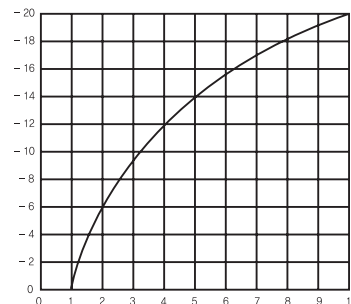
B : sound pressure level at distance L_b

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.

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

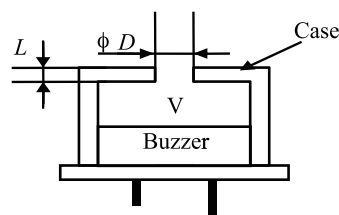
f_v : Resonator's resonant frequency(Hz)

C : 344,000(mm/sec)

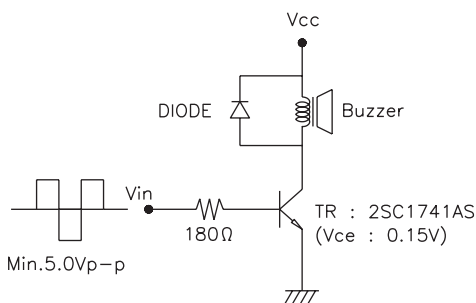
D : Inside diameter of sound emission hole(mm)

L : Thickness of sound emission hole side(mm)

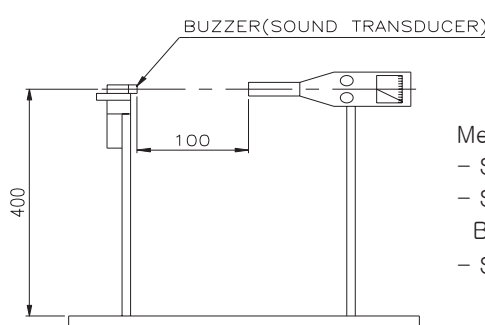
V : Resonator housing volume(sq. mm)



• Standard Driver Circuit



• Standard Test Fixture



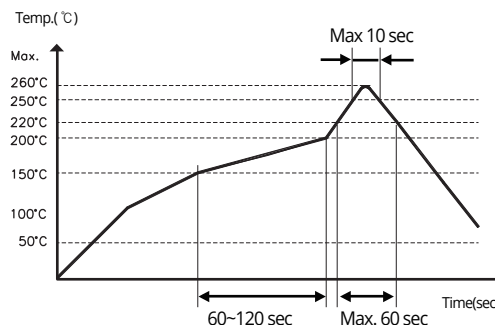
- Measurement Parts
- Set 400 mm height
 - Set 100 mm between Buzzer and SPL Meter
 - Set weight : "Fast" / "A"

• Soldering Condition

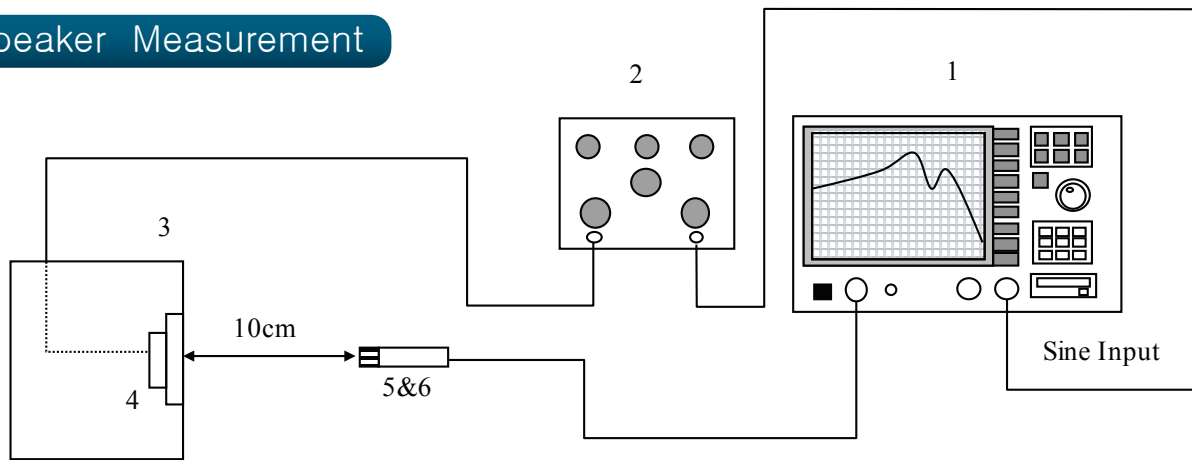
- Recommendable reflow soldering condition is as follows.

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

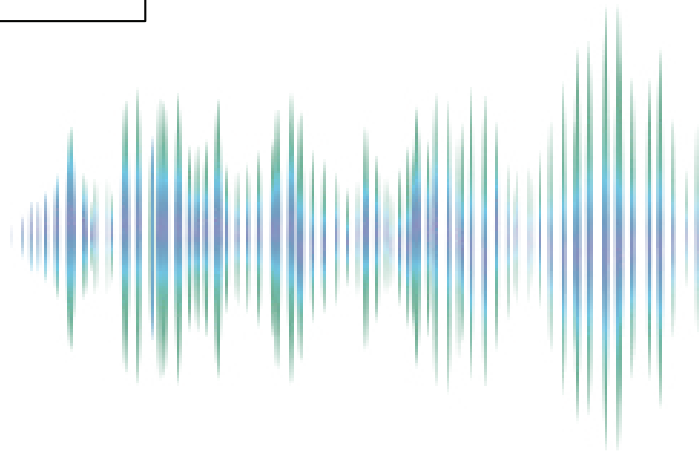
Note 2: Peak reflow temperature of 260 °C, with a maximum duration of 60 sec. between 220°C and 260°C



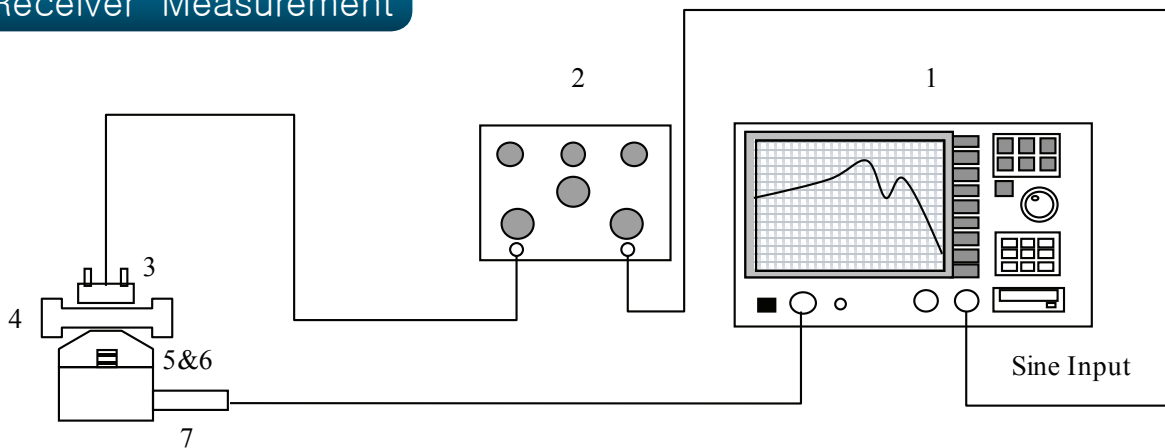
Speaker Measurement



| NO | EQUIPMENT | REMARKS |
|----|-----------------|------------------------------------|
| 1 | Audio Analyzer | B&K 2012 |
| 2 | Preamplifier | LAM 300 2716-A |
| 3 | Baffle Box | HS Standard (1000 m ²) |
| 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 |