ERD 320 - Phase 1 - Pure Tone Detection Planning — 8 August 2025

what about voltage at 2.8 kHz from the -60 dB SPL

↳ Difficult to get without full data sheet but can estimate it to be in micro volts

↳ Use pots to adjust everything to perfection

~~Need a~~ Flow of Circuit to build:

MIC-E1 PCB → Coupling + Bias → Pre-Amp Band-Pass Filter → Envelope Detector → Comparator

Bias Resistor

→ Provide DC voltage to power internal FET
→ Limits current to safe levels.

$$R_B = \frac{V_{supply} - V_{mic\_operating}}{I_{max}}$$

Using 5V supply where the comparator will be the buffer to supply 3.3V to the ESP32 to ensure no damage.

$$\therefore R_B = \frac{5 - V_{mic\_operating}}{0.5 \times 10^{-3}}$$ → $V_{mic\_operating}$ is not available will need a POT resistor as well.

↳ But max is 10 kΩ to ensure 0.5 mA
∴ Range is 0 − 10 kΩ.

08/08/2025

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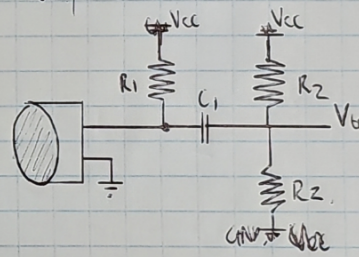
Coupling Capacitor:

$$f_c = \frac{1}{2\pi \cdot R_{load} \cdot C_{coupling}}$$

Currently we have:

AC signal from microphone → this needs to be biased to swing about 0 - 5V



$$R_1 = \frac{5 - V_{mic}}{I_{max}}$$

where Imax is the max current coming out of transducer.

R2 = R2 to make a 2.5 V bias to swing of the AC signal from the transducer.

~~This voltage is then fed into~~ LTspice will be used to simulate this design to ensure full operation.

Adding a source of 25 mV to emulate the voltage from the microphone.

Resolution of normal voltage source is too low → makes a jaddy wave not smooth at a specific frequency.

Need to add: .options abstol = 1n reltol = 1u vntol = 1n.

↳ Fixed issue.

Now Oscillates about 2.5 V with micro volts as the input.

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