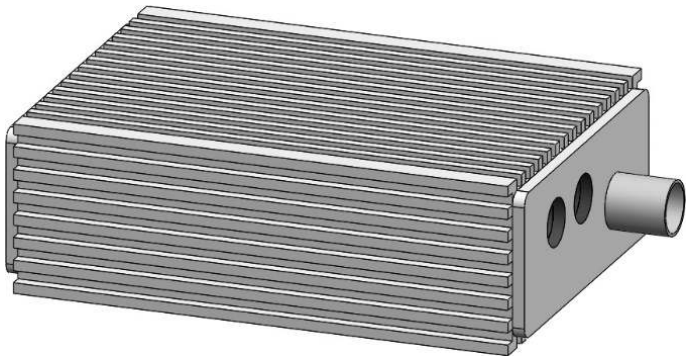
# Mono linear amplifier for MEMS Loudspeakers



## Features

- Low distortion
- Based on TI LM1875
- Class AB amplifier
- Up to 30 VPP for 150-nF load

## Description

Amalthea  is a linear amplifier for piezoelectric speakers

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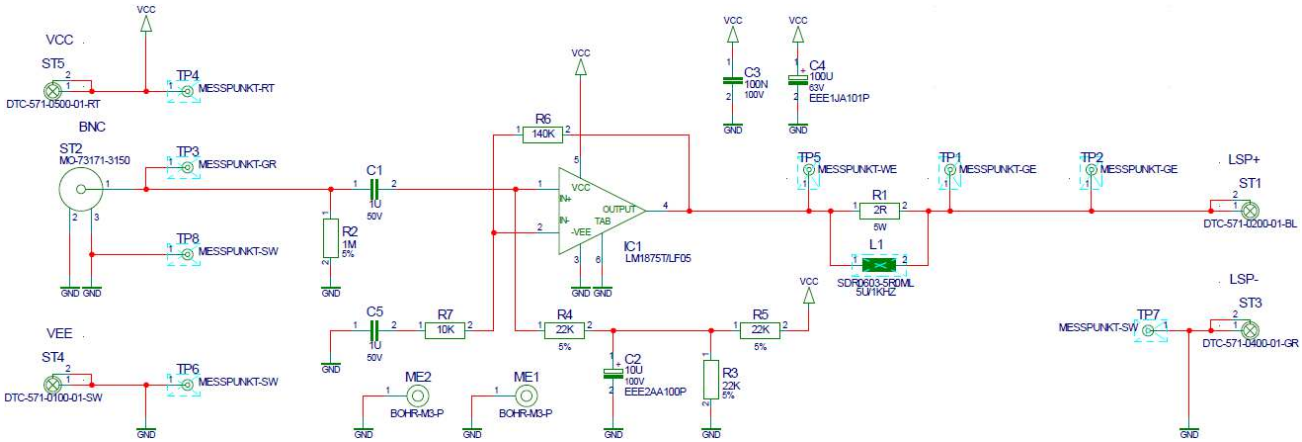
## 1 Introduction

Amalthea is a linear amplifier for piezoelectric speakers

## 2 Block Diagram



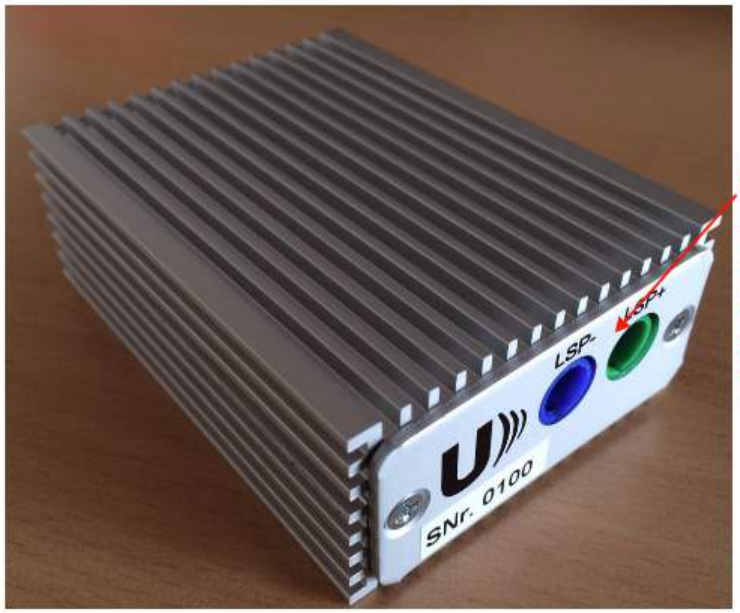

### 2.1 Bill of materials (BOM)

| Reference | Supplier | Footprint | Description |
|---|---|---|---|
| C1 | | 1206 | Capacitor, Multicom, Ceramic, X7R 1U/50V, 5% |
| C2 | Panasonic | CASE F | Electrolytic capacitor, Aluminium, fl. 10U/100V, 20% |
| C3 | | 1206 | Capacitor, Multico, Ceramic, X7R 100N/100V, 5% |
| C4 | Panasonic | CASE G | Electrolytic capacitor, Aluminium, fl. 100U/63V, 20% |
| C5 | | 1206 | Capacitor, Multicom, Ceramic, X7R 1U/50V, 10% |
| IC1 | Texas Instruments | LM1875T/LF05 | LM1875 20W audio power, 16..60V/4A, 25W |
| R1 | TE Connectivity | TE_SM_5 | Wire-wound resistor, 2R/500V, 5W, 5% |
| R2 | | 1206 | Resistor, 1M/200V, 0.25W, 5% |
| R3 | | 1206 | Resistor, 22K/200V, 0.25W, 5% |
| R4 | | 1206 | Resistor, 22K/200V, 0.25W, 5% |
| R5 | | 1206 | Resistor, 22K/200V, 0.25W, 5% |
| R6 | | 1206 | Resistor, 140K/200V, 0.25W, 1% |
| R7 | | 1206 | Resistor, 10K/200V, 0.25W, 1% |

## 3 Connections

Back side

- LSP+: banana socket
- LSP-: banana socket




Speaker output
$V_{CC}/2$
+ 'Audio Input' x Gain

'blue' belongs to the bottom electrode (BE) of the speaker

'green' belongs to all of the top electrodes (TE) of the speaker

Front side

- VCC: banana socket
- VEE: banana socket
- Audio Input: BNC connector


Audio Input

Power supply
$V_{CC}$ = 30 $V_{DC}$
recommended

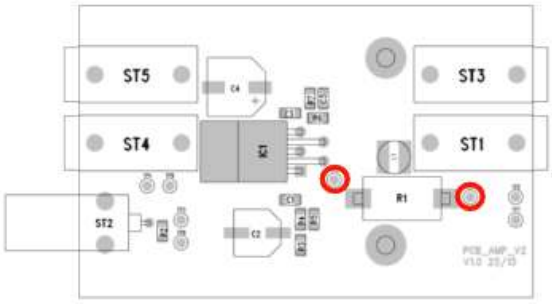
## 4 Operating conditions

| | |
|---|---|
| Supply voltage ($V_{CC}$) | 30 $V_{DC}$ recommended |
| Power Consumption (no input; $V_{CC}$ = 30 V) | < 1.5 W (< 50 mA) |
| Power Consumption (650 $mV_{rms}$; $V_{CC}$ = 30 V) | < 3.9 W (< 130 mA)<br>with bandwidth below 20 kHz |
| Max. input voltage (AC) | 650 $mV_{rms}$ (920 $mV_P$) |
| DC at 'Speaker output' | $V_{CC}$/2 from the DC supply<br>(recommended: $V_{CC}$ = 30 V) |
| Gain at 1 kHz | 15 (23.5 dB) |
| Frequency response (-3 dB) | 25 Hz – > 80 kHz |
| $THD_{typical}$ (100 Hz – 20 kHz; $V_{CC}$ = 30 V) | < 0.01 % |
| $THD_{max}$ (< 650 $V_{rms}$ at 'audio input'; $V_{CC}$ = 30 V) | < 0.1 % |

Make sure to connect the 'green' connector to the bottom electrode and the 'blue' connector to the top electrode of the Speaker. The voltage potential at the 'blue' output is higher than at the 'green' one. This is the correct bias voltage for the MEMS-Speaker.

**Note: CURRENT MEASUREMENT WITH AMALTHEA:**

A 2-Ωshunt resistance is included in Amalthea for current measurement. To use it, open the housing by removing the two screws at the front and the two at the back.

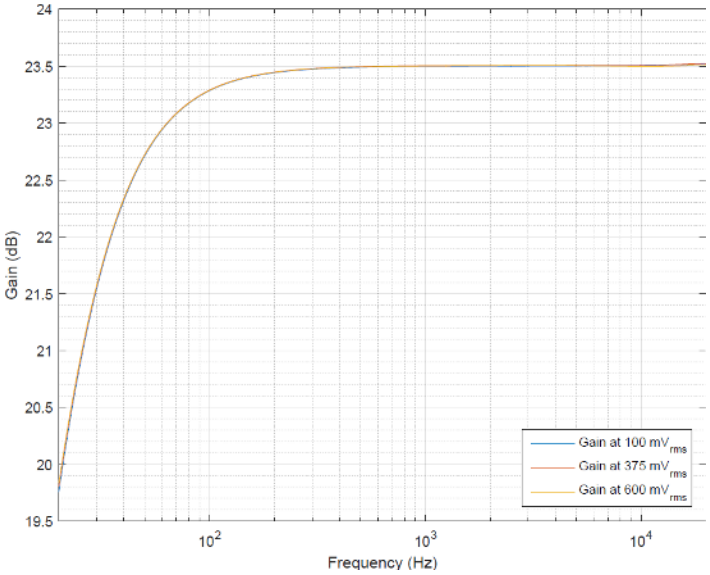



The voltage drop over the resistance (R1) can be measured between the test points TP1 and TP5 (marked in red) or directly at the resistance. The current through the load can then be calculated with the following formula:

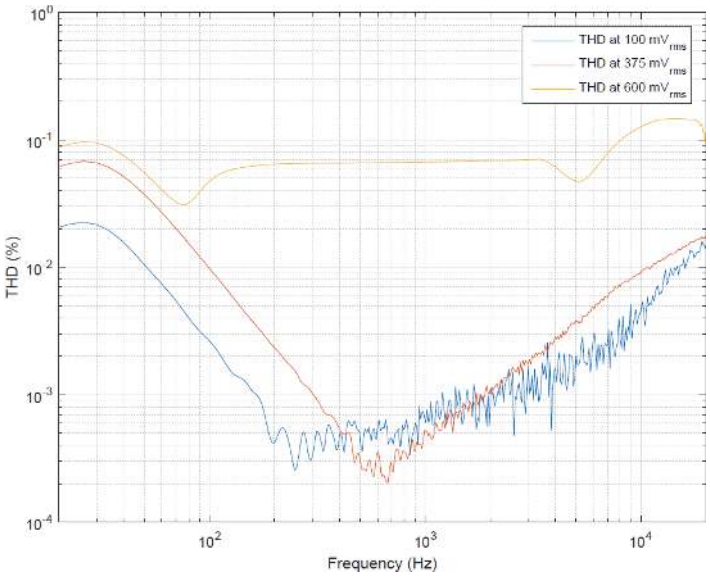
$$I = \frac{U_{shunt}}{R_{shunt}} = \frac{U_{shunt}}{2}$$

# 5 Characteristics

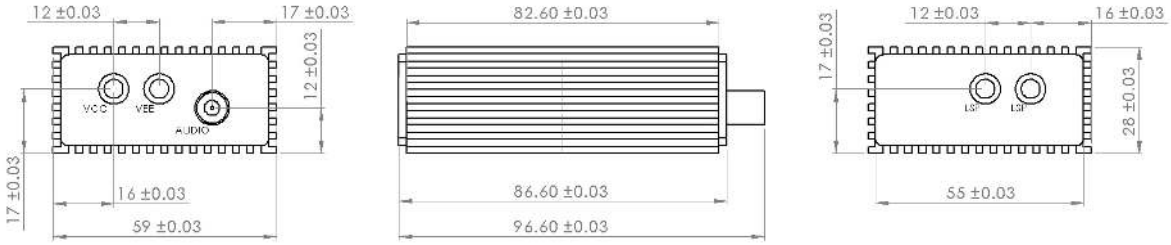
## 5.1 Gain




## 5.2 THD



## 6 Dimensions



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