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SAN3021
APPLICATION NOTE

SA2531/2 Single Chip Telephone: Using dynamic microphone as tone ringer

1 Scope

This Application Note describes how to modify the standard application AN1500A to use a dynamic microphone instead of the standard electret microphone. Additionally, an application is shown, which uses the dynamic microphone as tone ringer.

2 Key Features

- Updating existing systems using dynamic handset microphone
- No need for a piezo ringer when using the dynamic microphone as tone ringer

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3 Other applicable documents and papers

Application Note AN1500A: SA2532K Single Chip Telephone Demo Board

4 Revision status

SAN3021 Application Note (this document)
SAN3021 Schematic Rev. 1.1

5 General description

Dynamic handset microphones have been widely replaced by electret microphones, mainly because of higher output level, low EMC sensitivity and price issues. Therefore, the standard Single Chip Telephone application, AN1500 is based on using an electret handset microphone.

However, there are situations where usage of a dynamic microphone is still desired, e.g.
- when updating an existing design , using a dynamic handset microphone
- when taking advantage of the higher speech quality of dynamic microphones
- when using the dynamic microphone as tone ringer

6 Hardware configuration

Generally, because of the lower output level of a dynamic microphone (≈10dB less than an electret microphone) the microphone signal must be amplified by a simple 10dB amplifier before it can be fed into the microphone inputs, M1 and M2 of the SA2531/2.

In the following schematic, two basic considerations when using dynamic microphones are shown:
1. A single ended circuit, which uses the dynamic microphone for both microphone and tone ringer.
2. A differential circuit, which is fully balanced, to replace an electret microphone.

6.1 Using the Dynamic Microphone as Tone Ringer (Schematic :A)

6.1.1 Ringer part

The piezo tone ringer used in AN1500 can be replaced by a dynamic microphone, when close attention is paid to the following considerations :

Since a maximum sound pressure is required in ringing mode, the maximum DC current and AC level for the type of dynamic microphone used must not be exceeded.

To limit the output of the ringer amplifier Q4, the zener diode D4 should be reduced to 15V . R18 limits the output current, it can also be used to set the ringer volume.

Since the microphone (= the ringer) is connected single ended to V_{DD}, any noise on V_{DD} would be amplified by the microphone amplifier, causing higher noise for the transmitted signal. Therefore, D6 and C10 are added to reference the microphone amplifier input to V_{SS} (over C10) but at the same time keep the DC level above V_{DD} in ringing mode.

The ringer cannot be referenced to V_{SS}, because it would discharge V_{DD} during ringing!

With the application shown, the anode of D6 will be V_{DD}+0.7V, because during ringing V_{DD} is supplied over the ringing capacitor. (not shown).

6.1.2 Microphone Amplifier

Q5 is a simple “classic” amplifier, which amplifies the single ended signal by ≈10dB. Gain can be adjusted by varying R21. R23 is the feedback resistor to set a stable DC bias point. R24 and R25 are setting the base voltage. The transistor type used (in this case BC549) should be a general purpose low noise transistor.

The single ended signal is decoupled by C17. R26 is required to limit the input current to the amplifier during ringing.

C15 and C16 are EMC capacitors to limit the bandwidth of the amplifier. Frequencies >10kHz are being attenuated.

The amplifier is supplied by (the initial electret microphone supply) R20 and C14. C14 should be increased to 220µF. Since this supply is derived from the line output, there will be some small ripple from the transmitted signal at C14.

In order not to form a positive feedback loop from LI over the microphone supply, Q5 and the internal microphone amplifier (M1/M2 to LI) , care must be taken to connect M1/M2 inputs in the correct manner as shown in the application.

With this connection, a negative feedback loop is formed, rejecting any ripple on C14.

Because of the unbalanced, single ended structure of this amplifier, its input is very sensitive. Therefore it is recommended to use this application only in one-piece telephones with shortest possible wires between microphone and amplifier !

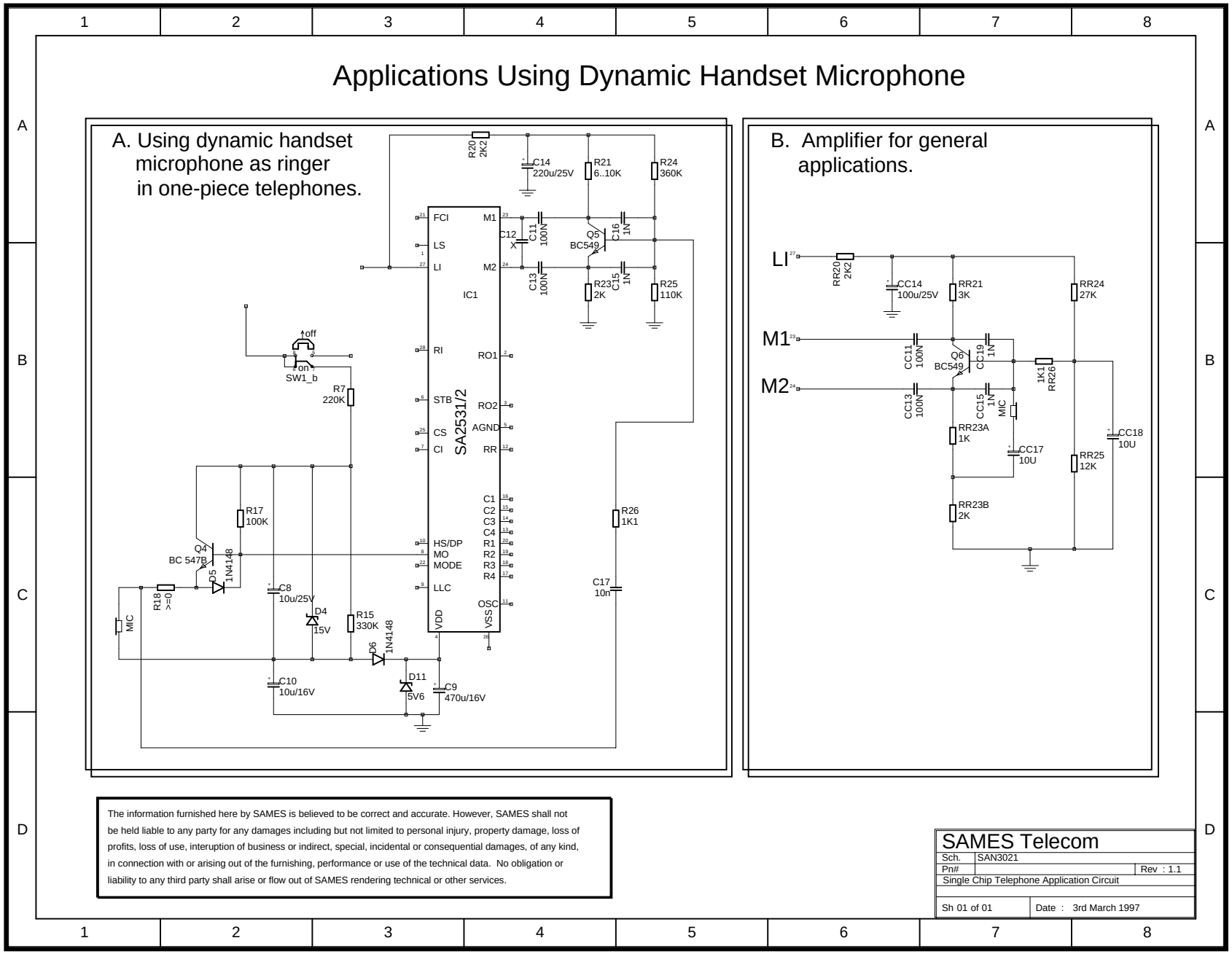
6.2 Amplifier for General Purpose Applications (Schematic :B)

This amplifier is similar to the amplifier described in pt. 6.1, however the microphone is balanced (RR23B and RR26 = 2kΩ).

Amplifier gain = RR21 / RR23B = 3:1 = 10dB.

This application can directly replace an electret microphone. Because of the differential, balanced structure of the amplifier input , it is also suitable for longer distances between microphone and amplifier, e.g. corded handsets.

7 Application schematic:



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