

# FM front end

## BA4402 / BA4404

The BA4402 and BA4404 are front end ICs for FM radio receivers. These devices can be used in a wide range of applications, from 3V portable radios to home stereo tuners.

The BA4402 and BA4404 consist of an RF amplifier, oscillator circuit, mixer circuit, and a variable capacitor-diode for AFC. They are pin compatible, and either can be selected depending on the amount of gain needed and other requirements of the application.

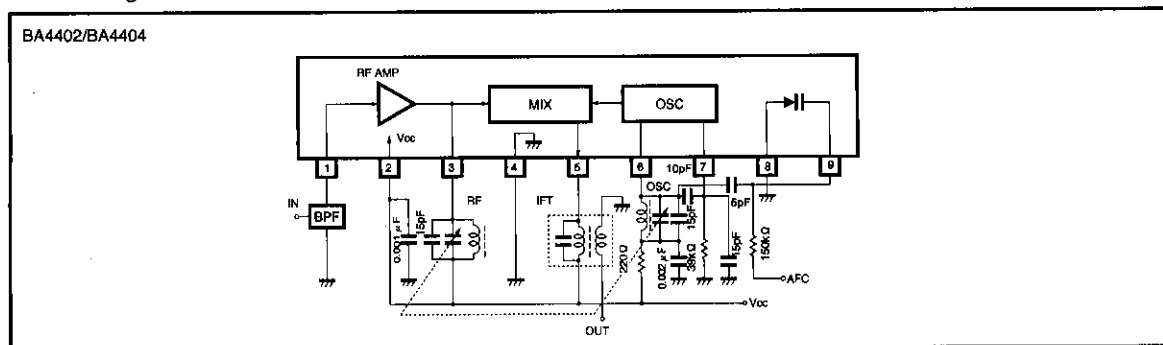
### ●Applications

FM pocket radios  
Radio cassette players  
Home stereos

### ●Features

- 1) Wide operating voltage range : 1.8 to 9V.
- 2) High gain with good stability.
- 3) An appropriate device can be selected depending on the need for AFC and the amount of gain required.

### ●Block diagram



| Product name | Variable capacitor | Gain | RF amplifier   |
|--------------|--------------------|------|----------------|
| BA4402       | Yes                | 32dB | Common base    |
| BA4404       | Yes                | 38dB | Common emitter |

● Absolute maximum ratings (Ta = 25°C)

| Parameter             | Symbol           | Limits  | Unit |
|-----------------------|------------------|---------|------|
| Supply voltage        | V <sub>CC</sub>  | 9       | V    |
| Power dissipation     | P <sub>d</sub>   | 1000*1  | mW   |
| Operating temperature | T <sub>opr</sub> | −25~75  | °C   |
| Storage temperature   | T <sub>stg</sub> | −55~125 | °C   |

\* 1 At temperatures above Ta = 25°C, decreases 10 mW per degree.

● Electrical characteristics (unless otherwise indicated, Ta = 25°C and V<sub>CC</sub> = 3V)

## BA4402

| Parameter                | Symbol            | Min. | Typ. | Max. | Unit | Conditions                             | Measurement Circuit |
|--------------------------|-------------------|------|------|------|------|----------------------------------------|---------------------|
| Quiescent current        | I <sub>Q</sub>    | —    | 2.5  | 4.0  | mA   | —                                      | Fig.1               |
| Output voltage 1         | V <sub>O1</sub>   | 25   | 40   | 55   | mV   | f <sub>IN</sub> =100MHz, 60dB $\mu$ V  | Fig.1               |
| Output voltage 2         | V <sub>O2</sub>   | 80   | 120  | 160  | mV   | f <sub>IN</sub> =100MHz, 100dB $\mu$ V | Fig.1               |
| Oscillator voltage       | V <sub>OSC</sub>  | 180  | 250  | 340  | mV   | V <sub>CC</sub> =2V                    | Fig.1               |
| Oscillation stop voltage | V <sub>STOP</sub> | —    | 1.4  | 1.6  | V    | —                                      | Fig.1               |

## BA4404

| Parameter                | Symbol            | Min. | Typ. | Max. | Unit | Conditions                             | Measurement Circuit |
|--------------------------|-------------------|------|------|------|------|----------------------------------------|---------------------|
| Quiescent current        | I <sub>Q</sub>    | —    | 3.0  | 5.0  | mA   | —                                      | Fig.1               |
| Output voltage 1         | V <sub>O1</sub>   | 55   | 80   | 120  | mV   | f <sub>IN</sub> =100MHz, 60dB $\mu$ V  | Fig.1               |
| Output voltage 2         | V <sub>O2</sub>   | 80   | 120  | 160  | mV   | f <sub>IN</sub> =100MHz, 100dB $\mu$ V | Fig.1               |
| Oscillator voltage       | V <sub>OSC</sub>  | 180  | 250  | 340  | mV   | V <sub>CC</sub> =2V                    | Fig.1               |
| Oscillation stop voltage | V <sub>STOP</sub> | —    | 1.4  | 1.6  | V    | —                                      | Fig.1               |

Front end

High-frequency signal processors

### ● Measurement circuit

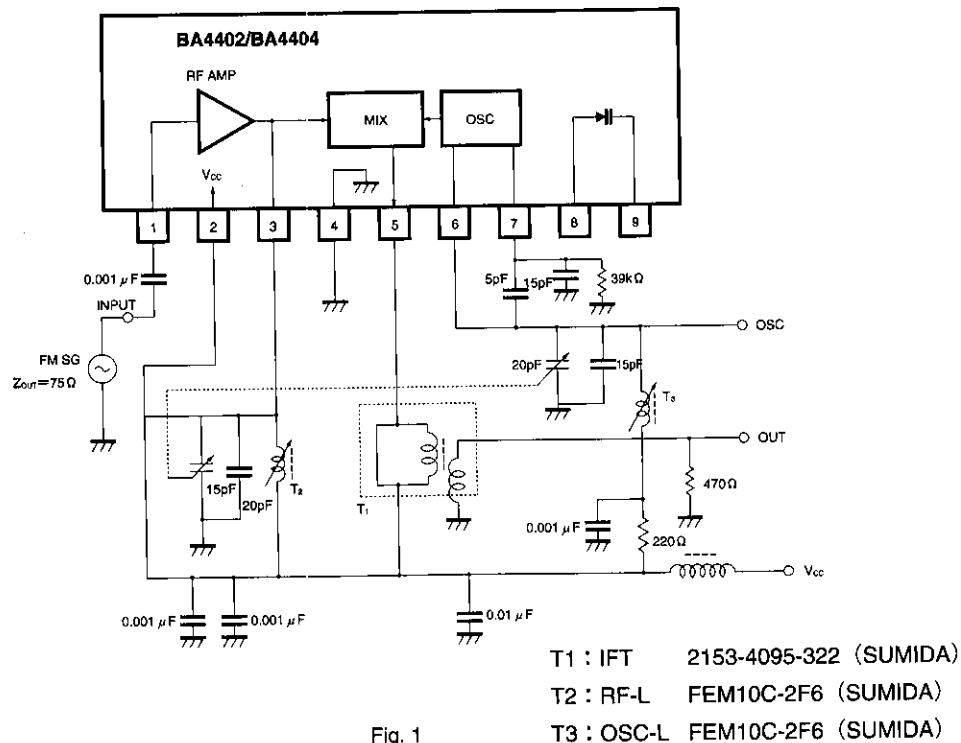


Fig. 1

### ● Application example

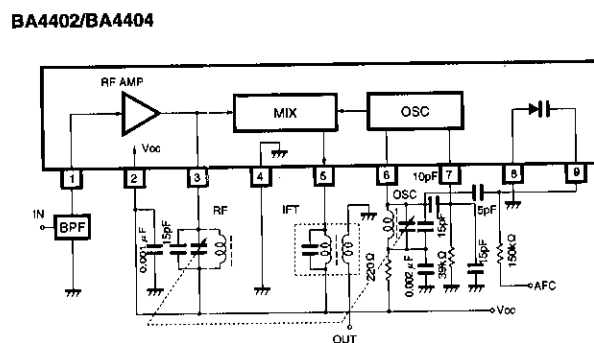


Fig. 2

## ● Electrical characteristic curves

## BA4402

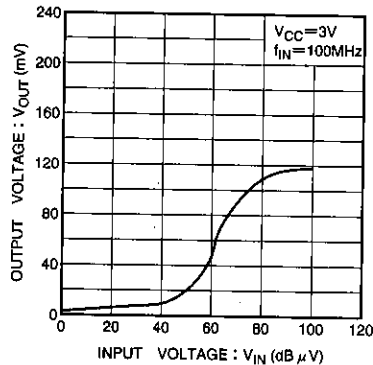


Fig. 3 Output voltage vs. input voltage

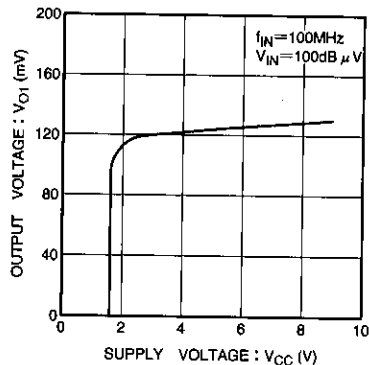


Fig. 4 Output voltage 1 vs. supply voltage

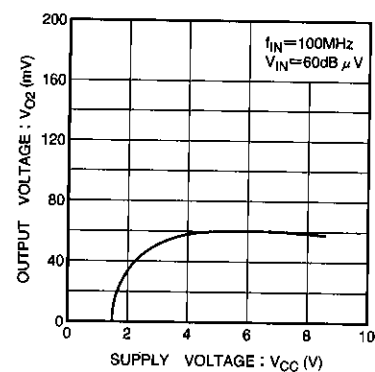


Fig. 5 Output voltage 2 vs. supply voltage

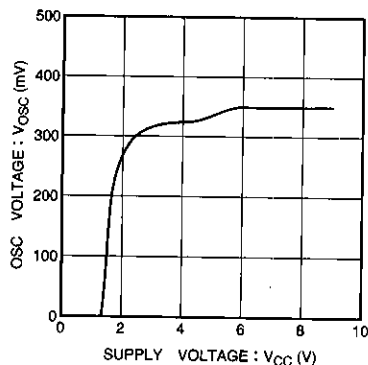


Fig. 6 Oscillator voltage vs. supply voltage

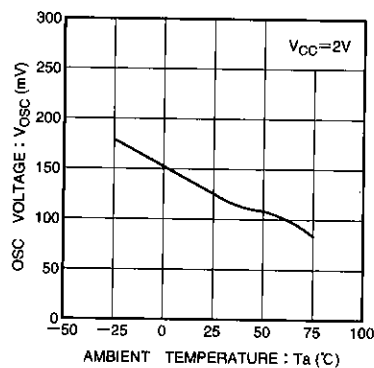


Fig. 7 Oscillator voltage vs. ambient temperature

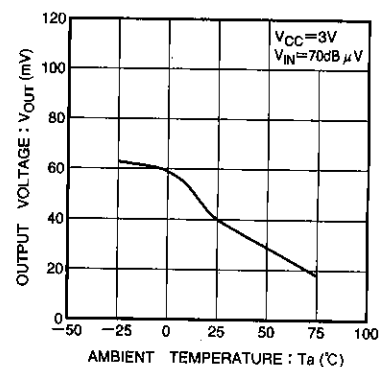


Fig. 8 Output voltage vs. ambient temperature

## BA4404

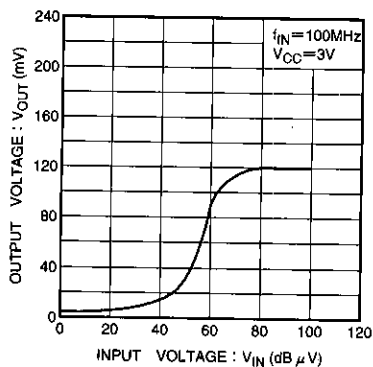


Fig. 9 Output voltage vs. input voltage

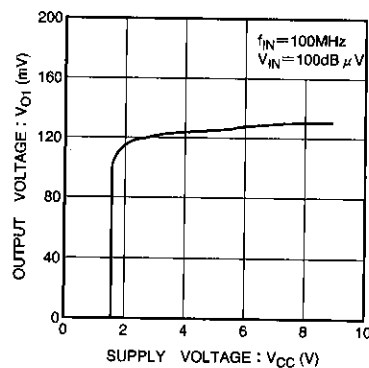


Fig. 10 Output voltage 1 vs. supply voltage

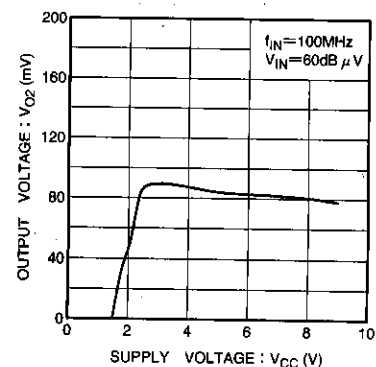


Fig. 11 Output voltage 2 vs. supply voltage

Front end

High-frequency signal processors

## BA4404

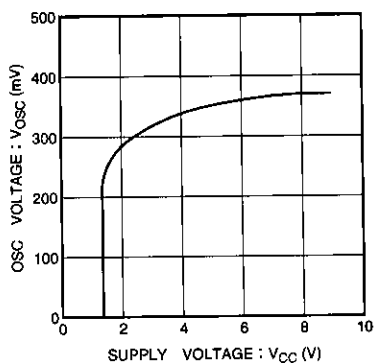


Fig. 12 Oscillator voltage vs. supply voltage

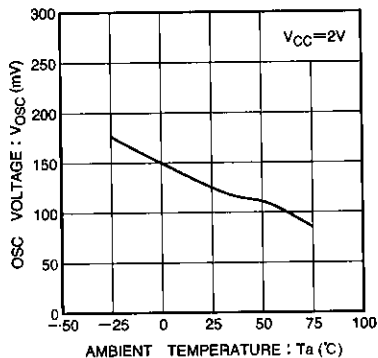


Fig. 13 Oscillator voltage vs. ambient temperature

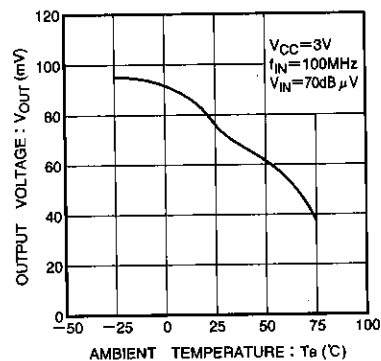


Fig. 14 Output voltage vs. ambient temperature

## BA4402/BA4404

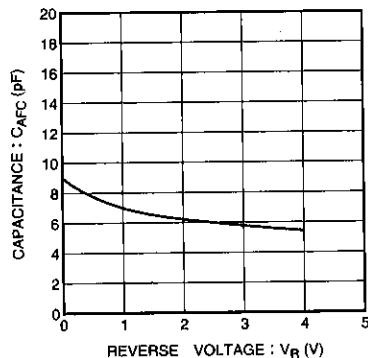
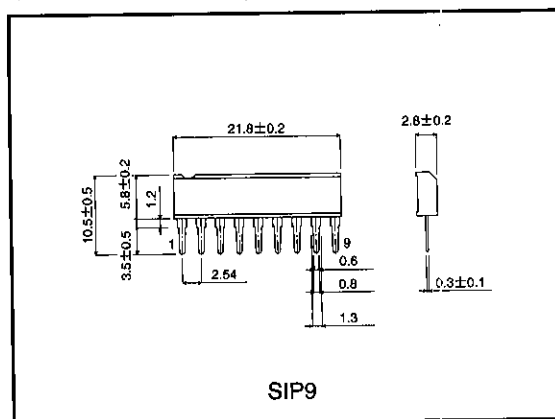


Fig. 15 AFC capacitor capacitance vs. applied voltage

## ● External dimensions (Unit: mm)



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