

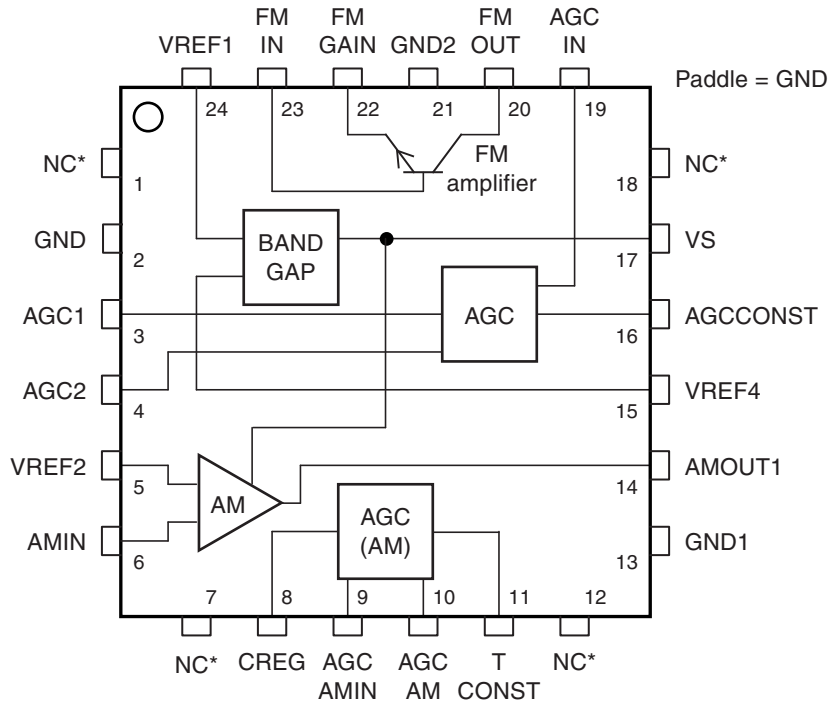
Features

- High Dynamic Range for AM and FM
- Integrated AGC for AM and FM
- High Intercept Point 3rd Order for FM
- FM Amplifier Adjustable to Various Cable Impedances
- High Intercept Point 2nd and 3rd Order for AM
- Low Noise Output Voltage
- Low Power Consumption
- Low Output Impedance AM

1. Description

The ATR4251 is an integrated low-noise AM/FM antenna amplifier with integrated AGC in BiCMOS2S technology. The device is designed in particular for car applications, and is suitable for windshield and roof antennas.

Figure 1-1. Block Diagram QFN24 Package



* Pin must not be connected to any other pin or supply chain except GND.

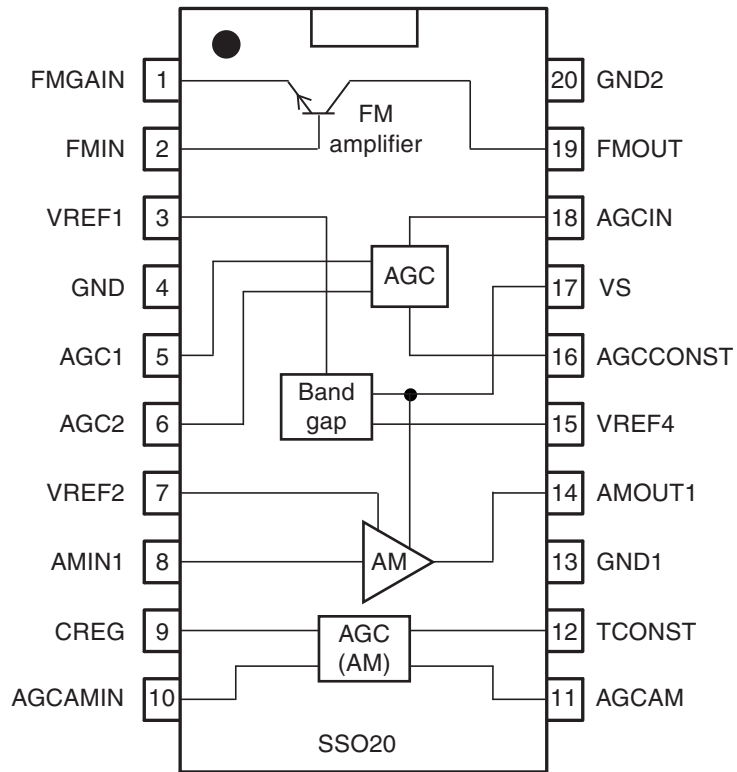


Low-noise, High-dynamic- range AM/FM Antenna Amplifier IC

ATR4251



Figure 1-2. Block Diagram SSO20 Package



2. Pin Configuration

Figure 2-1. Pinning QFN24

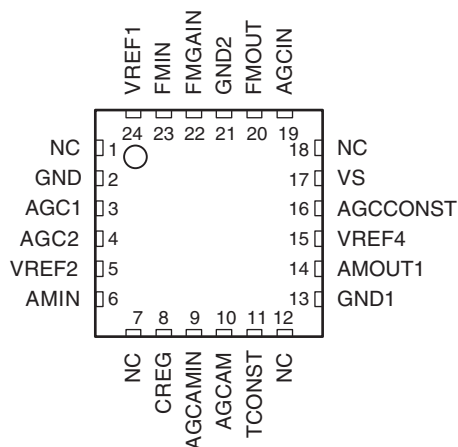


Table 2-1. Pin Description QFN24

| Pin | Symbol | Function |
|--------|----------|--|
| 1 | NC | Pin must not be connected to any other pin or supply chain except GND. |
| 2 | GND | Ground FM |
| 3 | AGC1 | AGC output for pin diode |
| 4 | AGC2 | AGC output for pin diode |
| 5 | VREF2 | Reference voltage for pin diode |
| 6 | AMIN | AM input, impedance matching |
| 7 | NC | Pin must not be connected to any other pin or supply chain except GND. |
| 8 | CREG | AM - AGC time constant capacitance 2 |
| 9 | AGCAMIN | AM - AGC input |
| 10 | AGCAM | AM - AGC output for pin diode |
| 11 | TCONST | AM - AGC - time constant capacitance 1 |
| 12 | NC | Pin must not be connected to any other pin or supply chain except GND. |
| 13 | GND1 | Ground AM |
| 14 | AMOUT1 | AM output, impedance matching |
| 15 | VREF4 | Bandgap |
| 16 | AGCCONST | FM AGC time constant |
| 17 | VS | Supply voltage |
| 18 | NC | Pin must not be connected to any other pin or supply chain except GND. |
| 19 | AGCIN | FM AGC input |
| 20 | FMOUT | FM output |
| 21 | GND2 | Ground |
| 22 | FMGAIN | FM gain adjustment |
| 23 | FMIN | FM input |
| 24 | VREF1 | Reference voltage 2.7V |
| Paddle | GND | Ground Paddle |

Figure 2-2. Pinning SSO20

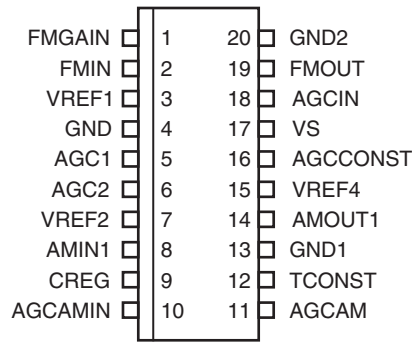


Table 2-2. Pin Description SSO20

| Pin | Symbol | Function |
|-----|----------|---------------------------------|
| 1 | FMGAIN | FM gain adjustment |
| 2 | FMIN | FM input |
| 3 | VREF1 | Reference voltage 2.7V |
| 4 | GND | FM ground |
| 5 | AGC1 | AGC output for PIN diode |
| 6 | AGC2 | AGC output for PIN diode |
| 7 | VREF2 | Reference voltage for PIN diode |
| 8 | AMIN1 | AM input, impedance matching |
| 9 | CREG | AM AGC constant capacitance 2 |
| 10 | AGCAMIN | AM input, AM AGC |
| 11 | AGCAM | AM AGC output for PIN diode |
| 12 | TCONST | AM AGC constant capacitance 1 |
| 13 | GND1 | AM ground |
| 14 | AMOUT1 | AM output, impedance matching |
| 15 | VREF4 | Band gap 6V |
| 16 | AGCCONST | FM AGC constant |
| 17 | VS | Supply voltage |
| 18 | AGCIN | FM AGC input |
| 19 | FMOUT | FM output |
| 20 | GND2 | FM ground |

3. Functional Description

The ATR4251 is an integrated AM/FM antenna impedance matching circuit. It compensates cable losses between the antenna (for example windshield, roof, or bumper antennas) and the car radio which is usually placed far away from the antenna.

AM refers to the long wave (LW), medium wave (MW) and short wave (SW) frequency bands (150 kHz to 30 MHz) that are usually used for AM transmission, and FM means any of the frequency bands used world-wide for FM radio broadcast (70 MHz to 110 MHz).

Two separate amplifiers are used for AM and FM due to the different operating frequencies and requirements in the AM and FM band. This allows the use of separate antennas (for example, windshield antennas) for AM and FM. Of course, both amplifiers can also be connected to one antenna (for example, the roof antenna).

Both amplifiers have automatic gain control (AGC) circuits in order to avoid overdriving the amplifiers under large-signal conditions. The two separate AGC circuits prevent strong AM signals from blocking FM stations, and vice versa.

3.1 AM Amplifier

Due to the long wavelength in AM bands, the antennas used for AM reception in automotive applications must be short compared to the wavelength. Therefore these antennas do not provide 50 Ω output impedance, but have an output impedance of some pF. If these (passive) antennas are connected to the car radio by a long cable, the capacitive load of this cable (some 100 pF) dramatically reduces the signal level at the tuner input.

In order to overcome this problem, ATR4251 provides an AM buffer amplifier with low input capacitance (less than 2.5 pF) and low output impedance (5 Ω). The low input capacitance of the amplifier reduces the capacitive load at the antenna, and the low impedance output driver is able to drive the capacitive load of the cable. The voltage gain of the amplifier is close to 1 (0 dB), but the insertion gain that is achieved when the buffer amplifier is inserted between antenna output and cable may be much higher (35 dB). The actual value depends, of course, on antenna and cable impedance.

The input of the amplifier is connected by an external 4.7 M Ω resistor to the bias voltage (pin 7, SSO20) in order to achieve high input impedance and low noise voltage.

AM tuners in car radios usually use PIN diode attenuators at their input. These PIN diode attenuators attenuate the signal by reducing the input impedance of the tuner. Therefore, a series resistor is used at the AM amplifier output in the standard application. This series resistor guarantees a well-defined source impedance for the radio tuner and protects the output of the AM amplifier from short circuit by the PIN diode attenuator in the car radio.

3.2 AM AGC

The IC is equipped with an AM AGC capability to prevent overdriving of the amplifier in case the amplifier operates near strong antenna signal level, for example, transmitters.

The AM amplifier output AMOUT1 is applied to a resistive voltage divider. This divided signal is applied to the AGC level detector input pin AGCAMIN. The rectified signal is compared against an internal reference. The threshold of the AGC can be adjusted by adjusting the divider ratio of the external voltage divider. If the threshold is reached, pin AGCAM opens an external transistor which controls PIN diode currents and limits the antenna signal and thereby prevents overdriving the AM amplifier IC.

3.3 FM Amplifier

The FM amplifier is realized with a single NPN transistor. This allows use of an amplifier configuration optimized on the requirements. For low-cost applications, the common emitter configuration provides good performance at reasonable bills of materials (BOM) cost⁽¹⁾. For high-end applications, common base configuration with lossless transformer feedback provides a high IP3 and a low noise figure at reasonable current consumption⁽²⁾. In both configurations, gain, input, and output impedance can be adjusted by modification of external components.

The temperature compensated bias voltage (VREF1) for the base of the NPN transistor is derived from an integrated band gap reference. The bias current of the FM amplifier is defined by an external resistor.

- Notes:
1. See test circuit ([Figure 8-1 on page 11](#))
 2. See application circuit ([Figure 9-1 on page 12](#))

3.4 FM/TV AGC

The IC is equipped with an AGC capability to prevent overdriving the amplifier in cases when the amplifier is operated with strong antenna signals (for example, near transmitters).

It is possible to realize an external TV antenna amplifier with integrated AGC and external RF transistor. The bandwidth of the integrated AGC circuit is 900 MHz.

FM amplifier output FMOUT is connected to a capacitive voltage divider and the divided signal is applied to the AGC level detector at pin AGCIN. This level detector input is optimized for low distortion. The rectified signal is compared against an internal reference. The threshold of the AGC can be adjusted by adjusting the divider ratio of the external voltage divider. If the threshold is reached, pin AGC1 opens an external transistor which controls the PIN diode current, this limits the amplifier input signal level and prevents overdriving the FM amplifier.

4. Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Reference point is ground (pins 4 and 13 for SSO20 and pins 2, 13, 21 and Paddle for QFN24 package).

| Parameters | Symbol | Value | Unit |
|--|-----------|-------------|------------------|
| Supply voltage | V_S | 12 | V |
| Power dissipation, P_{tot} at $T_{amb} = 90^\circ\text{C}$ | P_{tot} | 550 | mW |
| Junction temperature | T_j | 150 | $^\circ\text{C}$ |
| Ambient temperature SSO20 package | T_{amb} | -40 to +90 | $^\circ\text{C}$ |
| Ambient temperature QFN24 package | T_{amb} | -40 to +105 | $^\circ\text{C}$ |
| Storage temperature | T_{stg} | -50 to +150 | $^\circ\text{C}$ |
| ESD HMB | All pins | ± 2000 | V |
| ESD MM | All pins | ± 200 | V |

5. Thermal Resistance

| Parameters | Symbol | Value | Unit |
|---|------------|-------|------|
| Junction ambient, soldered on PCB, dependent on PCB Layout for SSO 20 package | R_{thJA} | 92 | K/W |
| Junction ambient, soldered on PCB, dependent on PCB Layout for QFN package | R_{thJA} | 40 | K/W |

6. Operating Range

| Parameters | Symbol | Min. | Typ. | Max. | Unit |
|------------------------------------|-----------|------|------|------|------------------|
| Supply voltage | V_S | 8 | 10 | 11 | V |
| Ambient temperature SSO20 package | T_{amb} | -40 | | +90 | $^\circ\text{C}$ |
| Ambient temperature QFN 24 package | T_{amb} | -40 | | +105 | $^\circ\text{C}$ |

7. Electrical Characteristics

See Test Circuit, [Figure 8-1 on page 11](#); $V_S = 10V$, $T_{amb} = 25^\circ C$, unless otherwise specified. Pin numbers in () are referred to the QFN package.

| No. | Parameters | Test Conditions | Pin | Symbol | Min. | Typ. | Max. | Unit | Type* |
|----------|--|---|-----------------|--|-------------|------------------------|-----------------------|--|-------|
| 1.1 | Supply currents | | 17 (17) | I_S | 11 | 14 | 17 | mA | A |
| 1.2 | Reference voltage 1 output | $I_{Vref1} = 1 \text{ mA}$ | 3 (24) | V_{Ref1} | 2.65 | 2.8 | 2.95 | V | A |
| 1.3 | Reference voltage 2 output | | 7 (5) | V_{Ref2} | $0.38 V_S$ | $0.4 V_S$ | $0.42 V_S$ | V | B |
| 1.4 | Reference voltage 4 output | $I_{Vref4} = 3 \text{ mA}$ | 15 (15) | V_{Ref4} | 6.0 | 6.25 | 6.5 | V | A |
| 2 | AM Impedance Matching 150 kHz to 30 MHz (The Frequency Response from Pin 8 to Pin 14) | | | | | | | | |
| 2.1 | Input capacitance | $f = 1 \text{ MHz}$ | 8 (6) | C_{AMIN} | 2.2 | 2.45 | 2.7 | pF | D |
| 2.2 | Input leakage current | $T_{amb} = 85^\circ C$ | 8 (6) | | | | 40 | nA | C |
| 2.3 | Output resistance | | 14 (14) | R_{OUT} | 4 | 5 | 8 | Ω | D |
| 2.4 | Voltage gain | $f = 1 \text{ MHz}$ | 8/14 (6/14) | A | 0.94 | 0.97 | 1 | | A |
| 2.5 | Output noise voltage (rms value) | Pin 14 (14), $R_{78} = 4.7 \text{ M}\Omega$, $B = 9 \text{ kHz}$, $C_{ANT} = 30 \text{ pF}$ 150 kHz 200 kHz 500 kHz 1 MHz | 14 | V_{N1} V_{N2} V_{N3} V_{N4} | | -8 -9 -11 -12 | -6 -7 -9 -10 | $\text{dB}\mu\text{V}$ $\text{dB}\mu\text{V}$ $\text{dB}\mu\text{V}$ $\text{dB}\mu\text{V}$ | C |
| 2.6 | 2 nd harmonic | $V_S = 10V$, 50Ω load, $f_{AMIN} = 1 \text{ MHz}$, input voltage = $120 \text{ dB}\mu\text{V}$ | AMOUT1 | | | -60 | -58 | dBc | C |
| 2.7 | 3 rd harmonic | $V_S = 10V$, 50Ω load, $f_{AMIN} = 1 \text{ MHz}$, input voltage = $120 \text{ dB}\mu\text{V}$ | AMOUT1 | | | -53 | -50 | dBc | C |
| 3 | AM AGC | | | | | | | | |
| 3.1 | Input resistance | | 10 (9) | $R_{AGCAMIN}$ | 40 | 50 | | $k\Omega$ | D |
| 3.2 | Input capacitance | $f = 1 \text{ MHz}$ | 10 (9) | $C_{AGCAMIN}$ | 2.6 | 3.2 | 3.8 | pF | D |
| 3.3 | AGC input voltage threshold | $f = 1 \text{ MHz}$ | 10 (9) | V_{AMth} | 75 | 77 | 79 | $\text{dB}\mu\text{V}$ | B |
| 3.4 | 3 dB corner frequency | AGC threshold increased by 3 dB | | | 10 | | | MHz | D |
| 3.5 | Minimal AGCAM output voltage | $V_{iHF} = 90 \text{ dB}\mu\text{V}$ at pin 10 (9) | 10/11 (9/10) | V_{AGC} | $V_S - 2.4$ | $V_S - 2.1$ | $V_S - 1.7$ | V | A |
| 3.6 | Maximal AGCAM output voltage | $V_{iHF} = 0V$ at pin 10 (9) | 10/11 (9/10) | V_{AGC} | $V_S - 0.2$ | $V_S - 0.1$ | | V | A |
| 3.7 | Maximal AGCAM output voltage ⁽¹⁾ | $V_{iHF} = 0V$ at pin 10 (9) $T = +85^\circ C$ | 10/11 (9/10) | V_{AGC} | $V_S - 0.4$ | $V_S - 0.3$ | | V | C |
| 3.8 | Maximum AGC sink current | $V_{iHF} = 0V$ at pin 10 (9) U (pin 12 (11)) = $2V$ | 12 (11) | I_{AMsink} | -150 | -120 | -90 | μA | A |

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

- Notes:
1. Leakage current of PIN diode can be adjusted by an external resistor between pin 11 and V_S
 2. Demo board measurements (see [Figure 8-1 on page 11](#) "Common Emitter Configuration")
 3. Demo board measurements (see [Figure 9-1 on page 12](#) "Common Base Configuration")

7. Electrical Characteristics (Continued)

See Test Circuit, [Figure 8-1 on page 11](#); $V_S = 10V$, $T_{amb} = 25^\circ C$, unless otherwise specified. Pin numbers in () are referred to the QFN package.

| No. | Parameters | Test Conditions | Pin | Symbol | Min. | Typ. | Max. | Unit | Type* |
|---|---|--|----------------|----------------------------------|--------------|--------------|--------------|--------------------------|--------|
| 3.9 | Transconductance of Level detector | $V_{iHF} = V_{AMth}$ at pin 10 (9) | 10/12 (9/11) | $\frac{I_{AM \sin k}}{V_{AMth}}$ | | 20 | | $\frac{\mu A}{mV_{rms}}$ | C |
| 3.10 | IP3 at level detector input | Figure 9-2 on page 13 , 1 MHz and 1,1MHz, 120 dB μ V | 10 (9) | | 150 | 170 | | dB μ V | D |
| 3.11 | PIN diode current generation | $d(20 \log I_{Pin-diode}) / dU_{Pin12}$ $T = 25^\circ C$, $U_{Pin12} = 2V$ | | | | 30 | | dB/V | D |
| 3.12 | Output resistance | | 9 (8) | R_{OUT} | 27 | 35 | 45 | k Ω | D |
| 4 | FM Amplifier | | | | | | | | |
| 4.1 | Emitter voltage | | 1 (22) | | 1.85 | 1.95 | 2.05 | V | A |
| 4.2 | Emitter voltage | $T = -40^\circ C$ to $+85^\circ C$ | 1 (22) | | 1.8 | 2.0 | 2.2 | V | C |
| 4.3 | Supply current limit | $R_E = 56\Omega$ | 19 (20) | I_{19} | | | 37 | mA | D |
| 4.4 | Maximum output voltage | $V_S = 10V$ | 19 (20) | | 12 | | | V_{pp} | D |
| 4.5 | Input resistance | $f = 100$ MHz | 2 (23) | R_{FMIN} | | 50 | | Ω | D |
| 4.6 | Output resistance | $f = 100$ MHz | 19 (20) | R_{FMOUT} | | 50 | | Ω | D |
| 4.7 | Power gain ⁽²⁾ | $f = 100$ MHz | FMOUT/ FMIN | G | | 5 | | dB | A |
| 4.8 | Output noise voltage (emitter circuit) ⁽²⁾ | $f = 100$ MHz, B = 120 kHz | 19 (20) | V_N | | -5.1 | | dB μ V | D |
| 4.9 | OIP3 (emitter circuit) ⁽²⁾ | $f = 98 + 99$ MHz | 19 (20) | I_{IP3} | | 140 | | dB μ V | C |
| 4.10 | Gain ⁽³⁾ | | | | | 6 | | dB | C |
| 4.11 | Noise figure ⁽³⁾ | | | | | 2.8 | | dB | C |
| 4.12 | OIP3 ⁽³⁾ | $f = 98 + 99$ MHz | | | | 148 | | dB μ V | C |
| Parameters Dependent of External Components in Application Circuit: R_{FMIN}, R_{FMOUT}, G, V_N, IIP3 | | | | | | | | | |
| 5 | FM AGC | | | | | | | | |
| 5.1 | AGC threshold | $f = 100$ MHz $f = 900$ MHz | 18 (19) | $V_{th,100}$ $V_{th,900}$ | 81 81 | 83 85 | 85 87 | dB μ V dB μ V | B B |
| 5.2 | AGC1 output voltage | AGC1 active, $V_{pin16(16)} = 5V$ | 5 (24) | V_{AGC} | $V_S - 2.1V$ | $V_S - 1.9V$ | $V_S - 1.7V$ | V | C |
| 5.3 | AGC1 output voltage | AGC1 inactive, $V_{pin16(16)} = 1.7V$ | 5 (24) | V_{AGC} | $V_S - 0.2V$ | V_S | | V | C |
| 5.4 | AGC2 output voltage | AGC2 active, $V_{pin16(16)} = 1.7V$ | 6 (4) | V_{AGC} | $V_S - 2.1V$ | $V_S - 1.9V$ | $V_S - 1.7V$ | V | C |
| 5.5 | AGC2 output voltage | AGC2 inactive, $V_{pin16(16)} = 5V$ | 6 (4) | V_{AGC} | $V_S - 0.2V$ | V_S | | V | C |
| 5.6 | Input resistance | | 18 (19) | R_{Pin18} | 17 | 21 | 25 | k Ω | D |

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

- Notes:
1. Leakage current of PIN diode can be adjusted by an external resistor between pin 11 and V_S
 2. Demo board measurements (see [Figure 8-1 on page 11](#) "Common Emitter Configuration")
 3. Demo board measurements (see [Figure 9-1 on page 12](#) "Common Base Configuration")



7. Electrical Characteristics (Continued)

See Test Circuit, [Figure 8-1 on page 11](#); $V_S = 10V$, $T_{amb} = 25^\circ C$, unless otherwise specified. Pin numbers in () are referred to the QFN package.

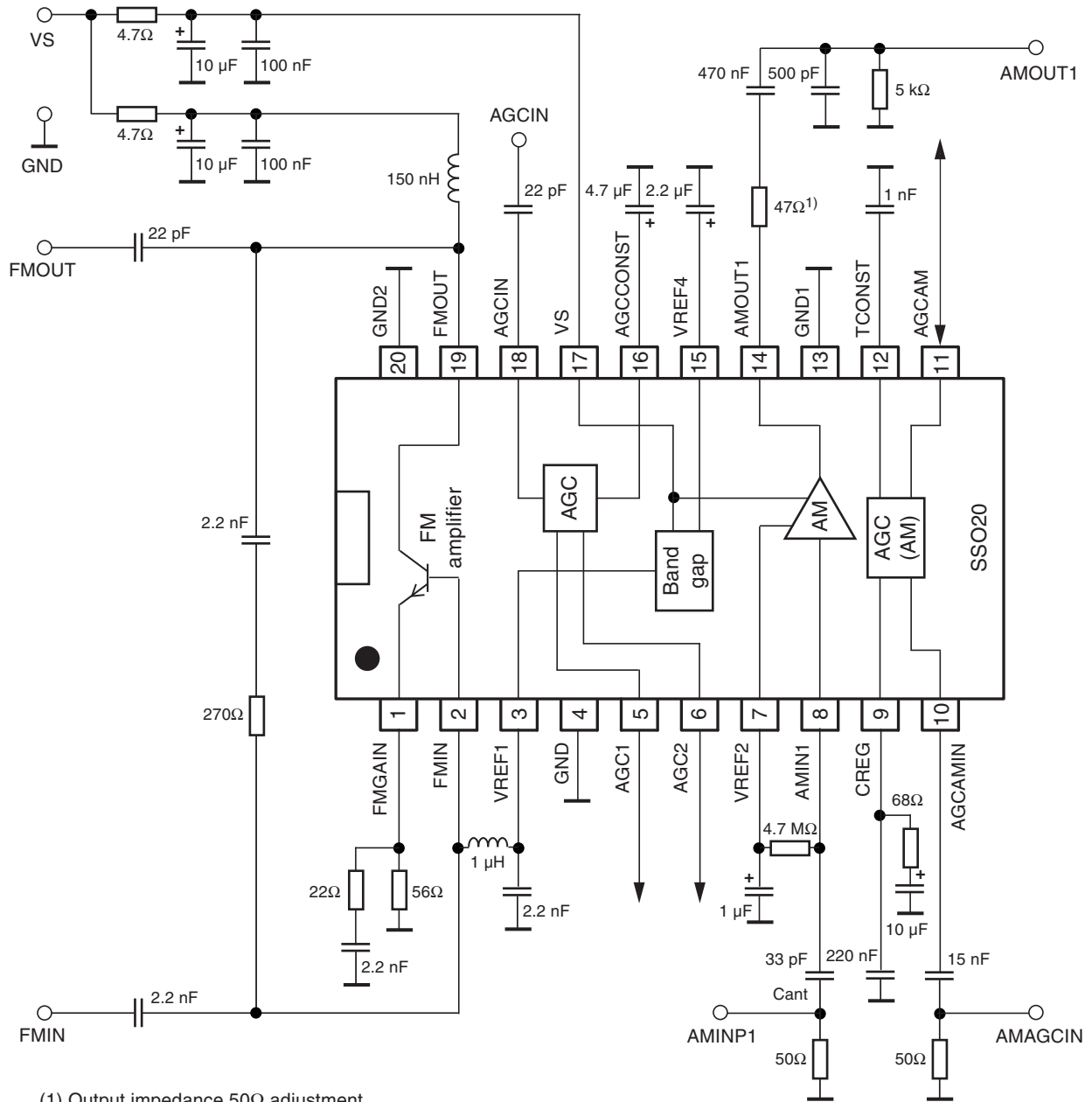
| No. | Parameters | Test Conditions | Pin | Symbol | Min. | Typ. | Max. | Unit | Type* |
|------|-----------------------|--|---------|---------------------------|------|------|------|------------|-------|
| 5.7 | Input capacitance | $F = 100 \text{ MHz}$ | 18 (19) | C_{Pin18} | 1.5 | 1.75 | 1.9 | pF | D |
| 5.8 | IP3 at AGC input | Figure 9-2 on page 13 , 100 MHz and 105 MHz, $V_{Gen} = 120 \text{ dB}\mu V$ | 18 (19) | | | 150 | | dB μV | D |
| 5.9 | IP3 at AGC input | 900 MHz and 920 MHz $V_{Gen} = 120 \text{ dB}\mu V$ | 18 (19) | | | 148 | | dB μV | D |
| 5.10 | Max. AGC sink current | $V_{iHF} = 0V$ | 16 | I_{Pin16} | -11 | -9 | -7 | μA | C |
| 5.11 | Transconductance | $V_{iHF} = V_{th1,100}$, $dI_{Pin16(16)} / dU_{Pin18(19)}$ | | dI_{Pin16} / dU_{Pin18} | 0.8 | 1.0 | 1.3 | mA/V (rms) | C |
| 5.12 | Gain AGC1, AGC2 | $U_{Pin16} = 3V$, $dU_{Pin5(3)} / dU_{Pin16(16)}$, $-dU_{Pin6(4)} / dU_{Pin16(16)}$ | | | 0.5 | 0.56 | 0.6 | | C |

*) Type means: A = 100% tested, B = 100% correlation tested, C = Characterized on samples, D = Design parameter

- Notes:
1. Leakage current of PIN diode can be adjusted by an external resistor between pin 11 and VS
 2. Demo board measurements (see [Figure 8-1 on page 11](#) "Common Emitter Configuration")
 3. Demo board measurements (see [Figure 9-1 on page 12](#) "Common Base Configuration")

8. Test Circuit FM/AM

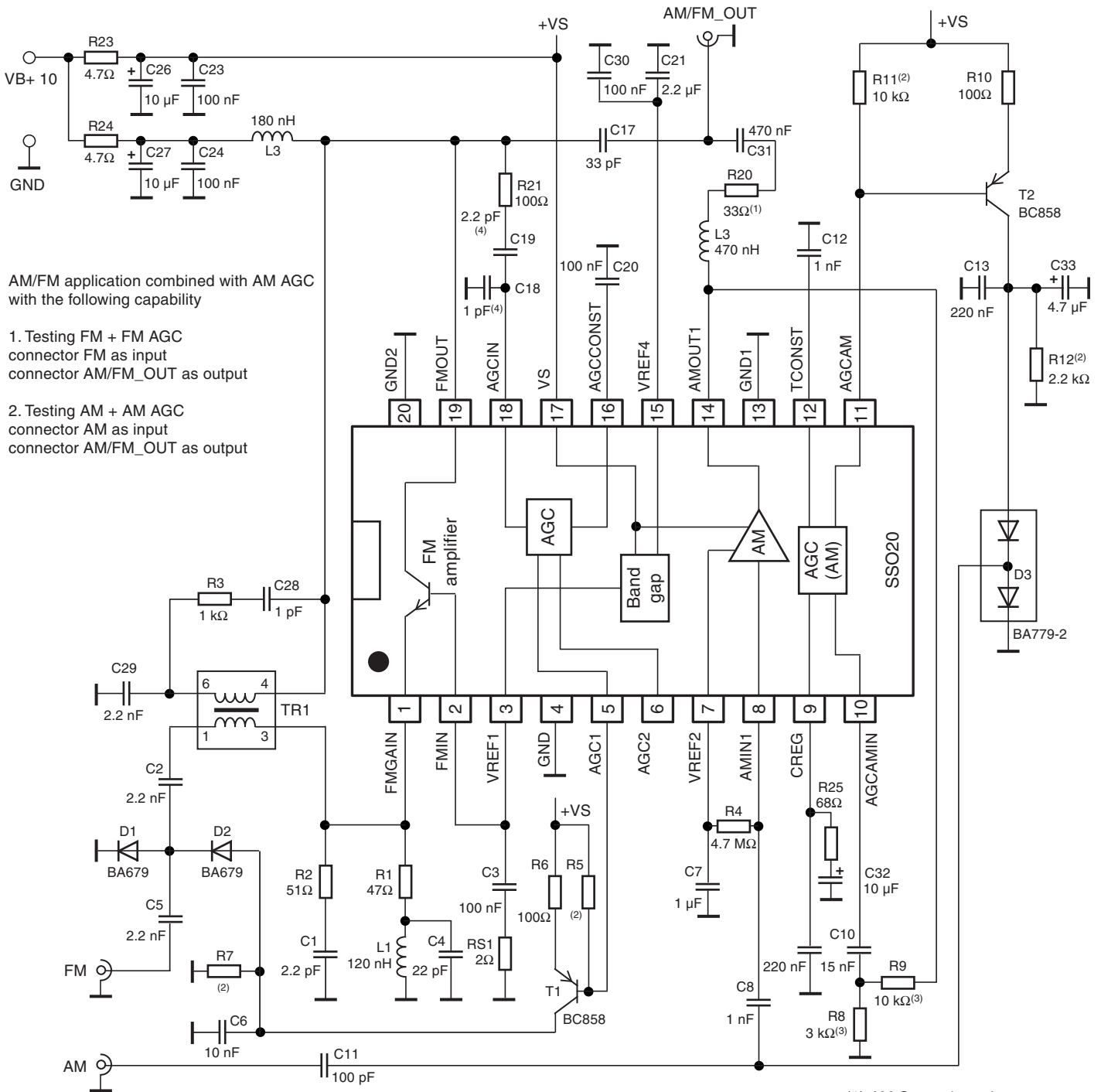
Figure 8-1. Common Emitter Configuration



(1) Output impedance 50Ω adjustment

9. Application Circuit (Demo Board)

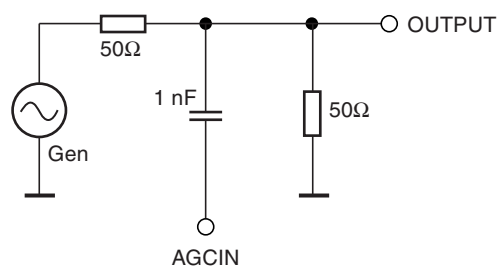
Figure 9-1. Common Base Configuration



AM/FM application combined with AM AGC with the following capability

1. Testing FM + FM AGC
connector FM as input
connector AM/FM_OUT as output
2. Testing AM + AM AGC
connector AM as input
connector AM/FM_OUT as output

- (1) AM Output impedance
(50Ω adjustment)
- (2) Leakage current reduction
- (3) AM AGC threshold
- (4) AM AGC threshold

Figure 9-2. Antenna Dummy for Test Purposes

10. Internal Circuitry

Table 10-1. Equivalent Pin Circuits (ESD Protection Circuits Not Shown)

| PIN SSO20 | PIN QFN24 | Symbol | Equivalent Circuit |
|--------------|----------------|-------------------------|--------------------|
| 1 2 19 | 22 23 20 | FMGAIN FMIN FMOUT | |
| 3 | 24 | VREF1 | |
| 4, 13, 20 | 2, 13, 21 | GND | |
| 5 6 | 3 4 | AGC1 AGC2 | |
| | 1, 7, 12, 18 | NC | |
| 7 | 5 | VREF2 | |

Table 10-1. Equivalent Pin Circuits (ESD Protection Circuits Not Shown) (Continued)

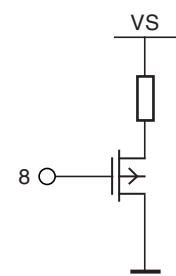
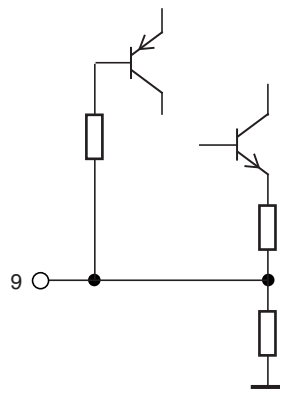
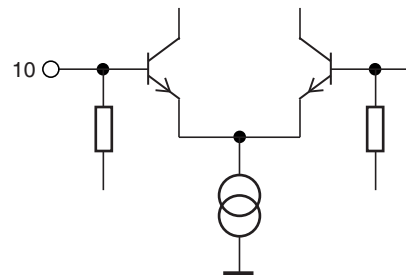
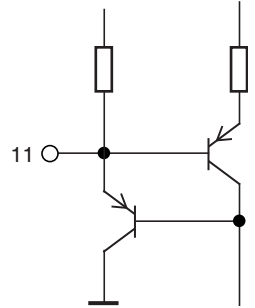
| PIN SSO20 | PIN QFN24 | Symbol | Equivalent Circuit |
|-----------|-----------|---------|--|
| 8 | 6 | AMIN1 |  |
| 9 | 8 | CREG |  |
| 10 | 9 | AGCAMIN |  |
| 11 | 10 | AGCAM |  |

Table 10-1. Equivalent Pin Circuits (ESD Protection Circuits Not Shown) (Continued)

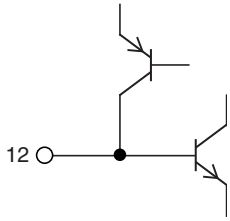
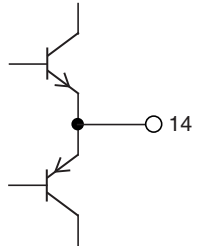
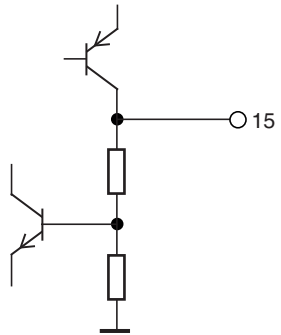
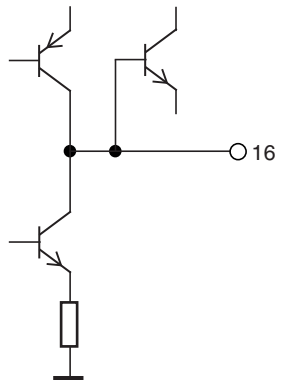
| PIN SSO20 | PIN QFN24 | Symbol | Equivalent Circuit |
|-----------|-----------|----------|--|
| 12 | 11 | TCONS |  |
| 14 | 14 | AMOUT1 |  |
| 15 | 15 | VREF4 |  |
| 16 | 16 | AGCCONST |  |
| 17 | 17 | VS | |

Table 10-1. Equivalent Pin Circuits (ESD Protection Circuits Not Shown) (Continued)

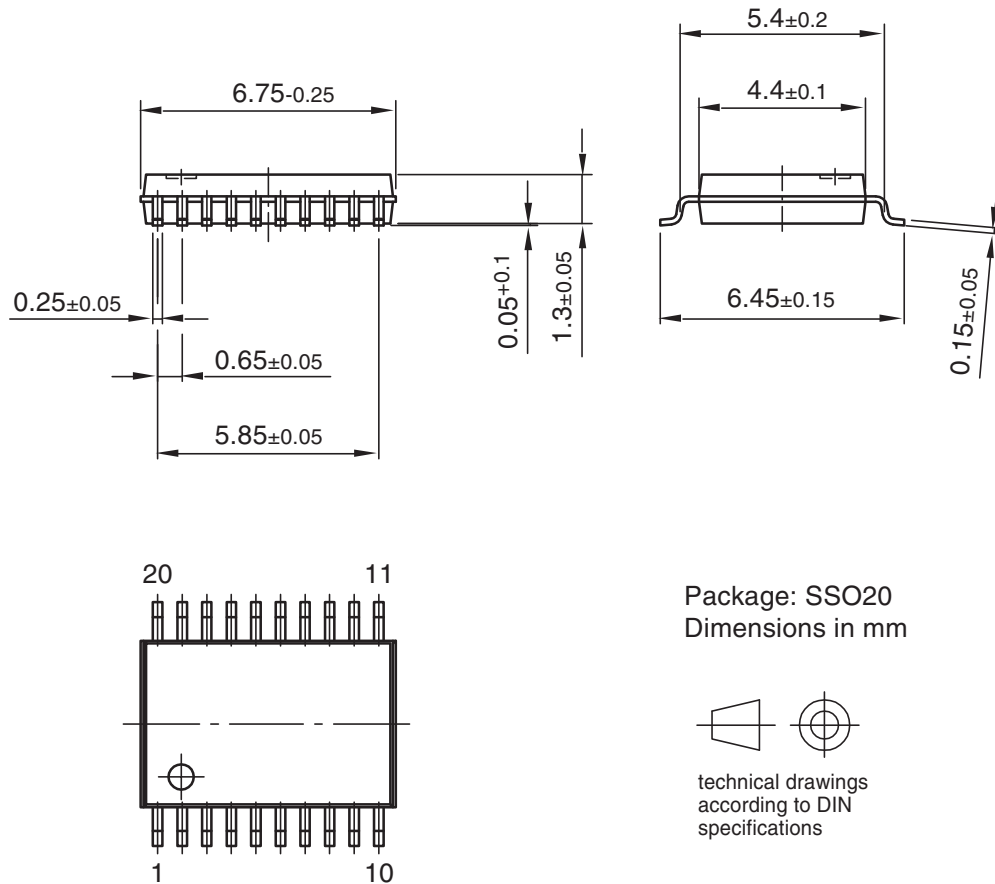
| PIN SSO20 | PIN QFN24 | Symbol | Equivalent Circuit |
|-----------|-----------|--------|--------------------|
| 18 | 19 | AGCIN | |

11. Ordering Information

| Extended Type Number | Package | Remarks | MOQ |
|----------------------|--------------------|------------------|-------------|
| ATR4251-TKSY | SSO20 | Sticks | 830 pieces |
| ATR4251-TKQY | SSO20 | Taped and reeled | 4000 pieces |
| ATR4251-PFQY | QFN24, 4 mm × 4 mm | Taped and reeled | 6000 pieces |
| ATR4251-PFPY | QFN24, 4 mm × 4 mm | Taped and reeled | 1500 pieces |

12. Package Information

Figure 12-1. SSO20



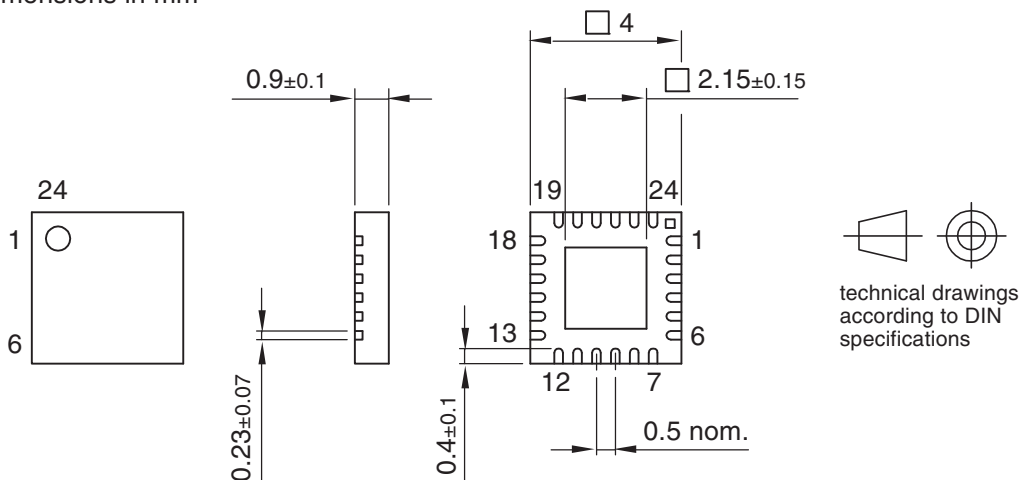
Drawing-No.: 6.543-5056.01-4

Issue: 1; 10.03.04

Figure 12-2. QFN24

Package: QFN 24 - 4 x 4
 Exposed pad 2.15 x 2.15
 (acc. JEDEC OUTLINE No. MO-220)

Dimensions in mm



Drawing-No.: 6.543-5086.01-4

Issue: 2; 24.01.03

13. Revision History

Please note that the following page numbers referred to in this section refer to the specific revision mentioned, not to this document.

| Revision No. | History |
|------------------|--|
| 4913J-AUDR-10/09 | <ul style="list-style-type: none"> • Section 11 “Ordering Information” on page 18 changed |
| 4913I-AUDR-03/08 | <ul style="list-style-type: none"> • Figure 1-1 “Block Diagram QFN24 Package” on page 1 changed • Figure 2-1 “Pinning QFN24” on page 3 changed • Table 2-1 “Pin Description QFN24” on page 3 changed • Table 10-1 “Equivalent Pin Circuits (ESD Protection Circuits Not Shown) on page 14 changed • Section 11 “Ordering Information” on page 18 changed |
| 4913H-AUDR-10/07 | <ul style="list-style-type: none"> • Section 7 “Electrical Characteristics” numbers 1.1, 1.2, 1.3, 1.4, 2.4, 3.5, 3.6, 4.3 and 5.1 on pages 8 to 9 changed • Section 7 “Electrical Characteristics” numbers 2.8 and 2.9 deleted • Figure 8-1 “Common Emitter Configuration” on page 11 changed |
| 4913G-AUDR-07/07 | <ul style="list-style-type: none"> • Figure 8-1 “Common Emitter Configuration” on page 11 changed • Figure 9-1 “Common Base Configuration” on page 12 changed |
| 4913F-AUDR-06/07 | <ul style="list-style-type: none"> • Put datasheet in a new template • Figure 8-1 “Common Emitter Configuration” on page 11 changed • Figure 8-1 “Common Base Configuration” on page 12 changed |
| 4913E-AUDR-02/07 | <ul style="list-style-type: none"> • Put datasheet in a new template • Figure 1-1 exchanged with figure 1-2 on pages 1 to 2 • Figure 2-1 exchanged with figure 2-2 on pages 3 to 4 • Table 2-1 exchanged with table 2-2 on pages 3 to 4 • Section 3.1 “AM Amplifier” on page 5 changed • Section 3.4 “FM AGC” on page 6 renamed in “FM/TV AGC” and changed • Section 7 “Electrical Characteristics” on pages 8 to 10 changed • Figure 9-1 “Common Base Configuration” on page 12 changed |



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