# SIEMENS AG IC-SPECIFICATION

# TDA 4362 X

## Differences to the last edition

Last Edition: **DOK-Nr. V66047-S1603-C200-G1** date: **11.12.97**

Page 11: #P7: Test values and units changed
#P8: Test values and units changed
#P11: Test values changed, wrong values in previous version

Page 12: #P21,22: Min max values added
#P23: Load resistor added and values changed

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## Table of Contents

### AM- Updown - Conversion



**This specification replaces the previous editions**

| DOK-Nr. | date | DOK-Nr. | date |
|---|---|---|---|
| V66047-S1603-C200-G1 | 11.12.97 | | |
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# SIEMENS AG IC-SPECIFICATION

# TDA 4362 X

## Functional Description, Application

### Dual-Conversion-AM-Receiver

**The TDA 4362 X is an integrated Dual-Conversion- AM-Receiver for use in car radios.**

**The input signal passes a linear mixer for conversion into the 1.IF (~10 MHz) . Via an external bandpass-filter (CER-filter, quartz filter) the 1. IF is converted in a second linear mixer to the 2. IF (~450kHz).**

**After an external narrowband-selectivity (CER-filter) the 2. IF passes an automatic gain controlled amplifier and is then demodulated to the AF.**

**Features**

- **High flexibility with an external preamplifier stage**
- **Symmetrical or asymmetrical mixer input**
- **2-Pin-Oscillator for the 1. LO**
- **1. LO with LC-tank circuit**
- **1. LO in 60 to 160 MHz range**
- **Low narrow band noise**
- **Divider for 1. LO by 6, 10**
- **Integrated AGC generation for the prestages**
- **Strictly symmetrical RF path**
- **Decoupled direct and divided counter outputs**
- **2. LO with external source input**
- **Output for gain controlled 2. IF**

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## Circuit Description

**The integrated circuit includes a 2-Pin oscillator (1.LO) with sym. input, buffered output and a double balanced mixer with symmetrical input. This stage converts the AM-Inputsignal to a 1. IF, which is much higher (~10 MHz) than the input frequencies. The 1. LO operates as a LC-varactor tuned oscillator in the same 100 MHz range like the FM-Tuner oscillator ( e.g. TUA 4310 X) . So the same peripherial elements can be used.**

**Depending on the signal strength the prestage AGC controls a MOSFET-prestage amplifier.**

**The 1. IF passes an external selectivity and is then converted in a symmetrical double balanced mixer to the 2. IF.**

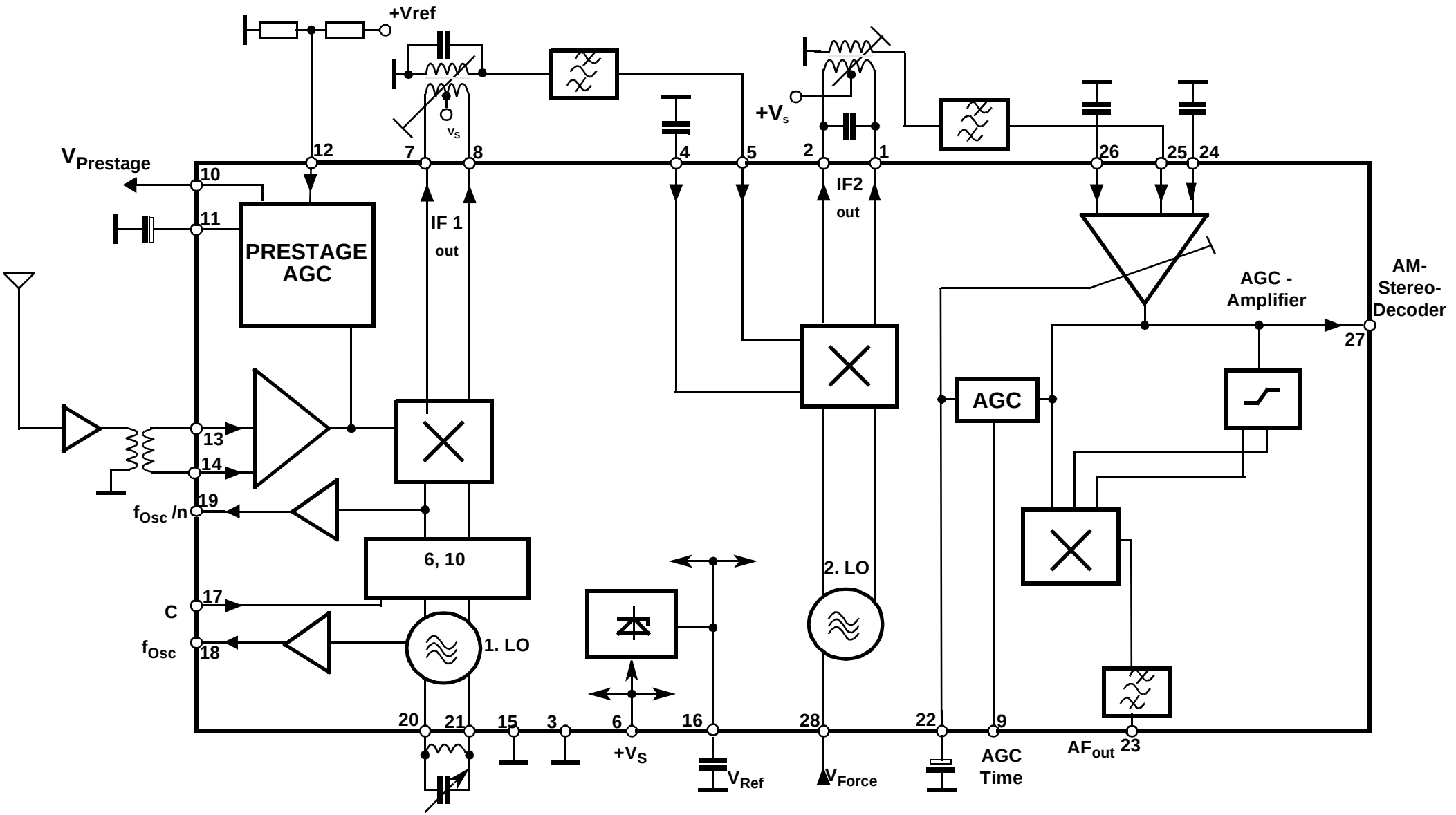
**The 2. LO operates as an amplifier for an external forcing signal.**

**The 2. IF signal passes an automatic gain controlled IF amplifier and is then demodulated to the AF in a quasi-synchronous-demodulator.**

**For AM-Stereo application a gain controlled output of the 2. IF is available.**

**The TDA 4362 X is prepared to work with a PLL in the 100MHz range. When applied with a standard AM-PLL the oscillator frequency divided by 6 or 10 has to be used. In this case a higher phase noise is to be expected.**

## Block Diagram



## Pin Assignment

### Pin configuration

1. **2. Mixer output**
2. **2. Mixer output**
3. **Ground (LF)**
4. **2. Mixer input**
5. **2. Mixer input**
6. **Supply voltage**
7. **1. Mixer output**
8. **1. Mixer output**
9. **AGC-time constant switch**
10. **Prestage voltage output**
11. **Prestage time constant**
12. **Prestage threshold**
13. **Mixer 1 input**
14. **Mixer 1 input**
15. **Ground**
16. **Reference voltage (RF)**
17. **Counter ratio C**
18. **Counter output direct**
19. **Counter output divided**
20. **Local oscillator**
21. **Local oscillator**
22. **LIF time constant**
23. **AF output**
24. **LIF input (blocked to LF GND)**
25. **LIF input active**
26. **LIF input (blocked to LF GND)**
27. **AM output**
28. **2. LO force input**

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## Pin Description

**Pin 1,2:** Open collector output of mixer 2 for the lower IF (~450 kHz)

**Pin 3:** GROUND: All LF blocking capacitors should be connected to this point.

**Pin 4,5:** Sym. mixer 2 input for the upper IF (~10.7 MHz). Asym. operation is possible. The input signal is converted to the lower IF corresponding the equation

$f_{LIF} = f_{UIF} - f_{2.LO}$

**Pin 6:** Supply-voltage. This point is to be blocked to ground for AF and for RF-Signals

**Pin 7,8:** Sym collector output of the mixer 1. The external tank circuit is tuned to the upper IF.

**Pin 9:** DC-Voltage determines the AGC-Time. GND: normal mode Vref: fast mode

**Pin 10:** Buffered prestage AGC output

**Pin 11:** Blocking capacitor for the prestage AGC

**Pin 12:** DC-Voltage alters the threshold voltage of the prestage AGC-circuit.

**Pin 13,14:** Sym. input for the AM-Signal in the frequency range of 100 kHz to 160 MHz .

**Pin 15:** GROUND: All DC-Values are referred to this pin. All RF blocking capacitors should be connected to this point.

**Pin 16:** Output for the internal reference voltage. This pin is to be blocked with a ceramic capacitor to RF ground.

**Pin17:** Input for the frequency divider.

**Pin 18:** Buffered output for the oscillator frequency

**Pin 19:** Buffered output for the by n divided (n= 6 or 10) Oscillator frequency

**Pin 20,21:** The ext. LC-Circuit determines the oscillator frequency

**Pin 22:** Blocking capacitor for the IF-AGC-Circuit to suppress AF-frequencies

**Pin 23:** Buffered AF output

**Pin 24,25,26:** Input-Pins for the DC-coupeled AGC-Amplifier 1.

**Pin 27:** Buffered output for the AGC-controlled lower IF-Signal. This pin is connected to the AM-Stereo-Decoder.

**Pin 28:** Input for the 2. Local oscillator (LO). The pin has to be forced with an ext. signal

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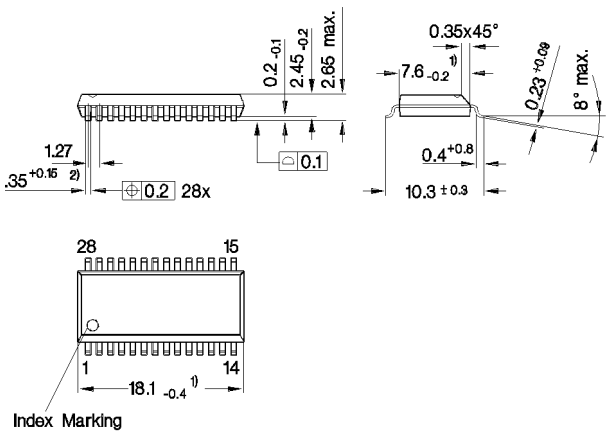
## Package Outline

### Plastic Package
### P-DSO-28-1




1) Does not include plastic or metal protrusion of 0.15 max. per side
2) Does not include dambar protrusion

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## Absolute Maximum Ratings

***The maximal ratings may not be exceeded under any circumstances, not even momentarily and individually, as permanent damage to the IC will result.***

| # | Max. Ratings for ambient temperature $T_{amb}$ -40°C to 85°C | Symbol | Min | Max | Units | Remarks |
|---|---|---|---|---|---|---|
| 1 | Supply voltage | $V_6$ | 0 | 13.2 | V | |
| 2 | Reference voltage | $V_{16}$ | 0 | 5 | V | |
| 3 | Reference current | $I_{16}$ | 0 | 1 | mA | |
| 4 | Prestage threshold | $V_{12}$ | 0 | 5 | V | |
| 5 | Mixer 1 input | $V_{13}$, $V_{14}$ | 0 | 5 | V | |
| 6 | Logical divider input | $V_{17}$ | 0 | 13.2 | V | |
| 7 | Counter output | $V_{18}$ | 0 | 13.2 | V | |
| 8 | Divided counter output | $V_{19}$ | 0 | 13.2 | V | |
| 9 | 1.LO | $V_{20}$, $V_{21}$ | 0 | 5 | V | |
| 10 | Time constant for 2 IF AGC | $V_{22}$ | 0 | 5 | V | |
| 11 | Leakage current | $I_{22}$ | | 1 | uA | |
| 12 | AF-output | $V_{23}$ | 0 | 13.2 | V | |
| 14 | AGC input | $V_{24}$ , $V_{25}$ , $V_{26}$ | 0 | 5 | V | |
| 15 | AM-Stereo output | $V_{27}$ | 0 | 13.2 | V | |
| 16 | 2. LO input | $V_{28}$ | 0 | 5 | V | |
| 17 | 2. Mixer output | $V_{1,2}$ | 0 | 5 | V | |
| 18 | 2. Mixer input | $V_{4,5}$ | 0 | 5 | V | |
| 19 | 1. Mixer output | $V_{7,8}$ | 0 | 13.2 | V | |
| 20 | AGC-Time | $V_9$ | 0 | 13.2 | V | |
| 21 | Prestage AGC | $V_{10}$ | 0 | 13.2 | V | |
| 22 | PrestageTime constante | $V_{11}$ | 0 | 13.2 | V | |
| 23 | ESD voltage human body model 100 pF/1500 Ω | $V_{ESD}$ | -2 | +2 | kV *) | |
| 24 | Thermal Resistance | $R_{thSA}$ | | 76 | k/W | |

***) 2 kV ESD protection is not valid for pin 28**

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## Operational Range

***Within the operational range the IC operates as described in the circuit description. The AC / DC characteristic limits are not guaranteed.***

| # | Parameter | Symbol | Min | Max | Units | Remarks |
|---|---|---|---|---|---|---|
| 1 | Supply Voltage | $V_6$ | 7.5 | 11 | V | |
| 2 | Ambient temperature | $T_{amb}$ | -40 | +85 | °C | |

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## AC / DC Characteristics

***AC / DC characteristics involve the spread of values guaranteed within the specified supply voltage and ambient temperature range. Typical characteristics are the median of the production.***

| # | Parameter | Symbol | Test Conditions | Test Circuit | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|---|
| | **Supply voltage** | | $V_S$=8.5V | | | | | |
| | **Ambient temperature** | | $T_{amb}$= 25 °C | | | | | |
| | | | $f_{IF1}$= 10.7 MHz | | | | | |
| | | | $f_{IF2}$= 450 kHz | | | | | |
| | | | $f_i$= 1 MHz | | | | | |
| 1 | Current consumption | $I_6$+ $I_1$+$I_2$+ $I_7$+$I_8$ | n=10 | 1 | 50 | 62 | 77 | mA |
| **Mixer 1** | | | | | | | | |
| 2 | Interceptpoint 3. Order | IP3 | $\|V_{13}$-$V_{14}\|$ | Lab | | 130 | | dBuV |
| 3 | Mixer gain | v | 20 lg $V_5$ / $\|V_{13}$-$V_{14}\|$ | 1 | 0 | 2 | 4 | dB |
| 4 | Max. input voltage | $\|V_{13}$-$V_{14}\|$ | for -1 dB compression | 1 | | | 600 | $mV_{pp}$ |
| 5 | Noise figure (10 MHz) | F | | Lab | | | 10 | dB |
| **1. LO** | | | | | | | | |
| 6 | Frequency range | $f_{1.LO}$ | | Lab | 60 | | 160 | MHz |
| 7 | Counter output | $V_{18}$ | $R_L$=330Ω | 1 | 70 | 100 | | $mV_{rms}$ |
| 8 | Divided counter output | $V_{19}$ | $R_L$=330Ω | 1 | 35 | 50 | | $mV_{rms}$ |
| 9 | Output impedance | $R_{ex18}$ | | Lab | | 330 | | Ω |
| 10 | Output impedance | $R_{ex19}$ | | Lab | | 330 | | Ω |
| **Converter** | | | | | | | | |
| 11 | Mixer gain | V | | 1 | 2 | 5 | 8 | dB |
| 12 | Noise figure | F | | Lab | | | 10 | dB |
| **2. LO** | | | | | | | | |
| 13 | Frequency range | $f_{2.LO}$ | | 1 | 25 | | | MHz |
| 14 | External force voltage | $V_{28}$ | | 1 | 60 | | | $mV_{rms}$ |
| **Prestage AGC output** | | | | | | | | |
| 15 | AGC-Voltage | $U_{10}$ | $\|V_{13}$-$V_{14}\|$=0$mV_{rms}$ | 1 | 6.3 | 7.2 | $V_S$ | V |
| 16 | AGC-Voltage | $U_{10}$ | $\|V_{13}$-$V_{14}\|$=400$mV_{rms}$ | 1 | | 0.7 | 1 | V |
| 17 | Integrator current | $I_{11}$* | $\|V_{13}$-$V_{14}\|$=0$mV_{rms}$ | 1 | | -30 | | uA |
| 18 | Integrator current | $I_{11}$* | $\|V_{13}$-$V_{14}\|$=200$mV_{rms}$ | 1 | | 30 | | uA |

***) integrator currents are measured between the output pin (- Pole of the measurement equipment) and a voltage source with a value of $3V_{DC}$ (+ Pole).**

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## AC / DC Characteristics

***AC / DC characteristics involve the spread of values guaranteed within the specified supply voltage and ambient temperature range. Typical characteristics are the median of the production.***

| # | Parameter | Symbol | Test Conditions | Test Circuit | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|---|
| | **AGC-Amplifier** | | $V_i = \|V_{25}-V_{26}\|$ | | | | | |
| 19 | AGC-Range | | | 1 | 60 | 66 | | dB |
| 20 | AGC-Voltage | $V_{22}$ | $V_i$=0 $mV_{rms}$ | 1 | | 0.6 | 1 | V |
| 21 | AGC-Voltage | $V_{22}$ | $V_i$=500 $\mu V_{rms}$ | 1 | 1.1 | 1.45 | 1.8 | V |
| 22 | AGC-Voltage | $V_{22}$ | $V_i$=30 $mV_{rms}$ | 1 | 2.7 | 3.1 | 3.7 | V |
| 23 | reg. output voltage | $V_{27}$ | $R_L$=100kΩ | 1 | 48 | 60 | | $mV_{rms}$ |
| 24 | Input sensitivity | $V_i$ | $V_{23\|100mV}$ - 3dB | 1 | | 100 | | $\mu V_{rms}$ |
| 25 | AGC-current | $I_{22}$ | $V_i$=100$mV_{rms}$ AGC=fast | 1 | 400 | 500 | 650 | µA |
| 26 | AGC-current | $I_{22}$ | $V_i$= 0$mV_{rms}$ AGC=fast | 1 | -400 | -500 | -650 | µA |
| 27 | AGC-current | $I_{22}$ | $V_i$=100$mV_{rms}$ AGC=slow | 1 | 15 | 25 | 35 | µA |
| 28 | AGC-current | $I_{22}$ | $V_i$= 0$mV_{rms}$ AGC=slow | 1 | -13 | -25 | -33 | µA |
| | **AM-Demodulator** | | $V_i = \|V_{25}-V_{26}\|$ | | | | | |
| 29 | AF output voltage | $V_{23}$ | m=0.3 | Lab | | 180 | | $mV_{rms}$ |
| 30 | AF output voltage | $V_{23}$ | m=0.8 | 1 | 400 | 480 | 560 | $mV_{rms}$ |
| 31 | Total harm. distortion | k | $V_i$ =10 $mV_{rms}$, m=0.8 | 1 | | 1 | 1.7 | % |
| 32 | Input voltage for S+N/N=6 dB | $V_i$ | m=0.3 | Lab | 10 | | | $\mu V_{rms}$ |
| 33 | Input voltage for S+N/N=26 dB | $V_i$ | m=0.3 | Lab | 100 | | | $\mu V_{rms}$ |
| 34 | S+N/N | | $V_i$ =10 mV, m= 0.8 | 1 | 58 | 64 | | dB |
| 35 | AF-Linearity | $\Delta V_{23}$ | 100µV/100 mV | 1 | | | 3 | dB |
| | **Divider Ratio** | | | | | | | |
| 36 | Input voltage "L" | $V_{17}$ | divide by 10 | 1 | 0 | | 1.5 | V |
| 37 | Input voltage "H" | $V_{17}$ | divide by 6 | 1 | 3.0 | | $V_S$ | V |
| | **AGC-Times** | | | | | | | |
| 38 | Fast | $V_9$ | | 1 | 2.0 | | $V_S$ | V |
| 39 | Slow | $V_9$ | | 1 | 0 | | 0.7 | V |
| | **Reference voltage** | | | | | | | |
| 40 | Reference voltage | $V_{16}$ | | 1 | 4.5 | 4.8 | 5.1 | V |

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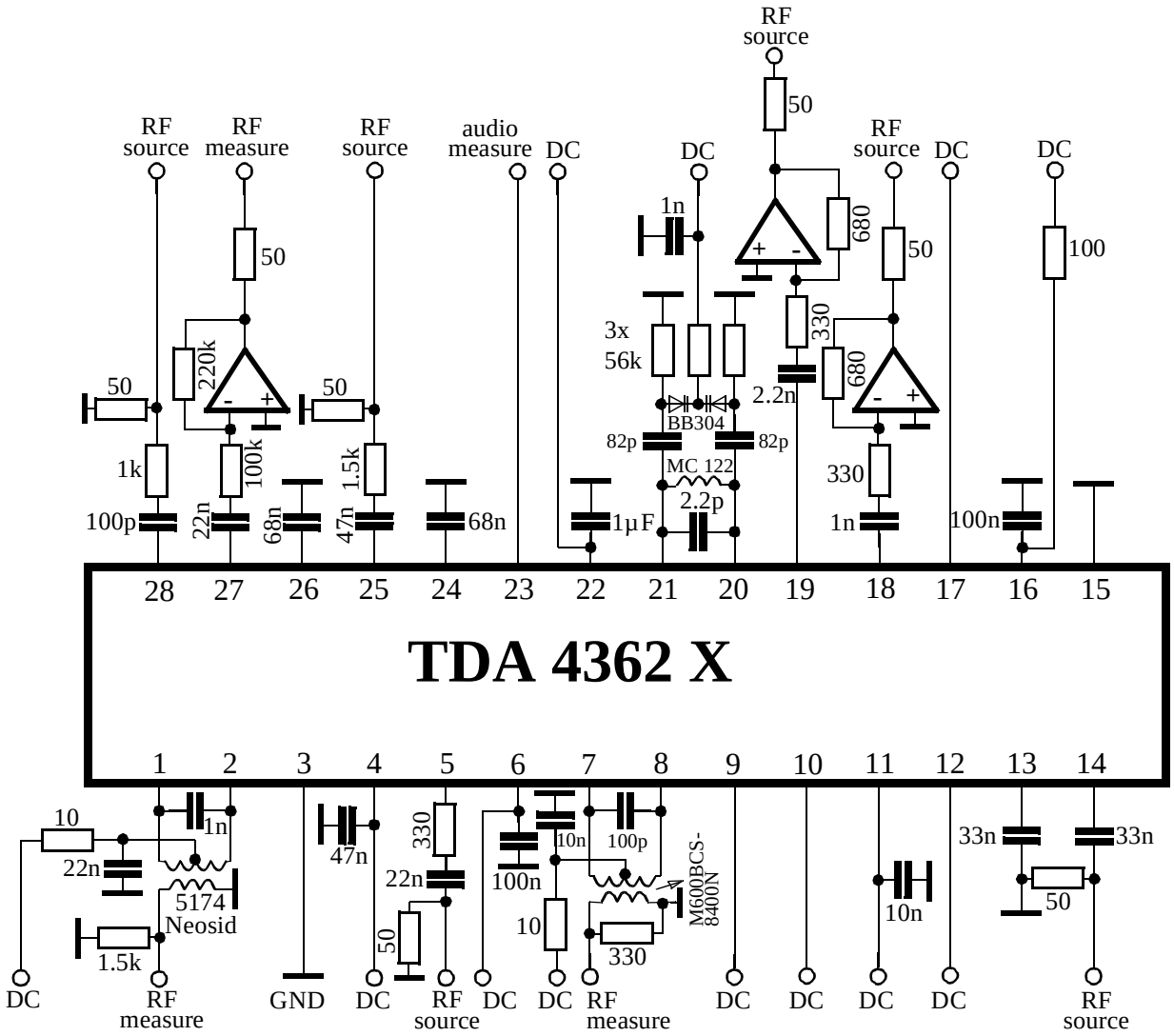
## Test Circuit



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## Application Circuit