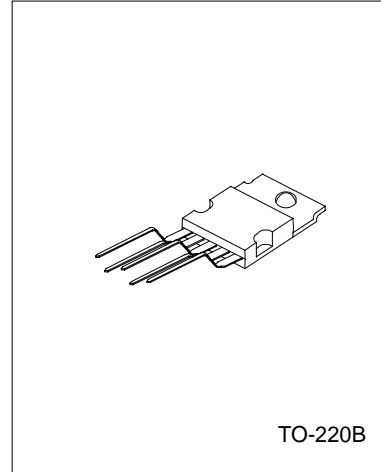


10W CAR RADIO AUDIO AMPLIFIER

DESCRIPTION

The UTC2003 has improved performance with the same pin configuration as the UTC2002. The additional features of UTC2002, very low number of external components, ease of assembly, space and cost saving, are maintained.

The device provides a high output current capacity (up to 3.5A) very low harmonic and crossover distortion. Completely safe operation is guaranteed due to protection against DC and AC short circuit between all pins and ground, thermal over-range, load dump voltage surge up to 40V and fortuitous open ground.



ABSOLUTE MAXIMUM RATINGS_(Ta=25°C)

| CHARACTERISTICS | SYMBOL | VALUE | UNITS |
|--|------------------|----------|-------|
| Peak Supply Voltage | V _s | 40 | V |
| DC supply Voltage | V _s | 28 | V |
| Operating supply voltage | V _s | 18 | V |
| Output peak current (repetitive) | I _o | 3.5 | A |
| Output peak current (non repetitive) | I _o | 4.5 | A |
| Power dissipation at T _{case} =90°C | P _{tot} | 20 | W |
| Storage temperature | T _{stg} | -40~+150 | °C |
| junction temperature | T _j | -40~+150 | °C |

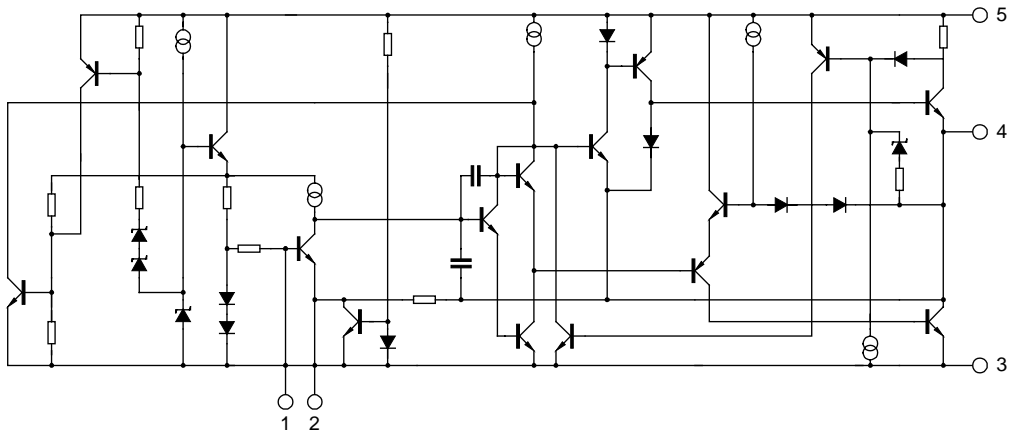
PIN CONNECTION

- 1 Non inverting input
- 2 Inverting input
- 3 Ground
- 4 Output
- 5 Supply Voltage

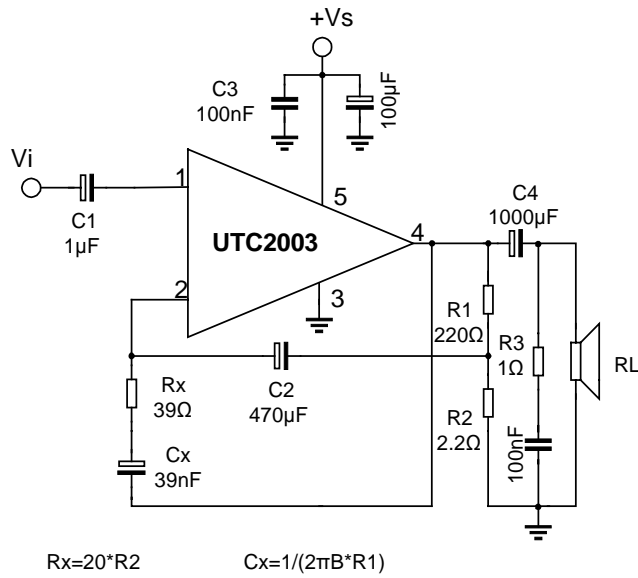
UTC2003

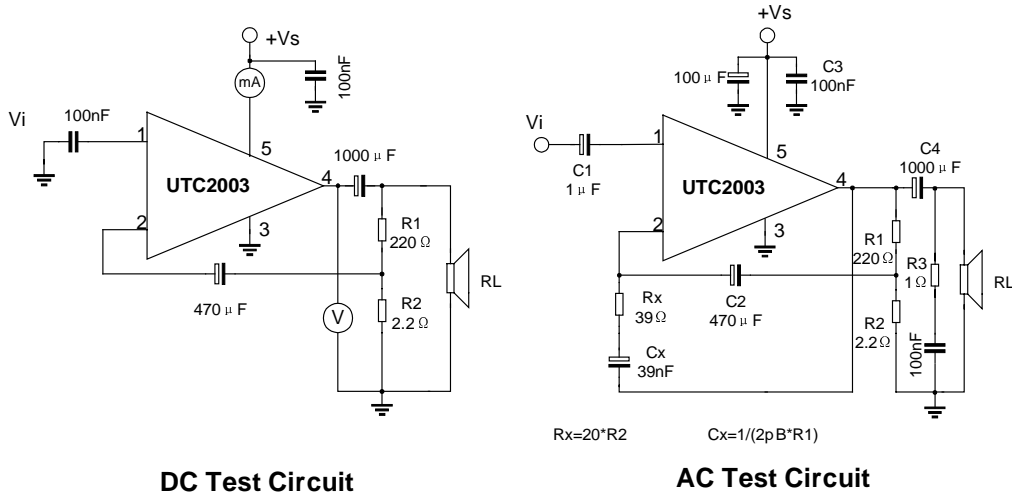
LINEAR INTEGRATED CIRCUIT

SCHEMATIC DIAGRAM



TEST CIRCUIT





DC Test Circuit

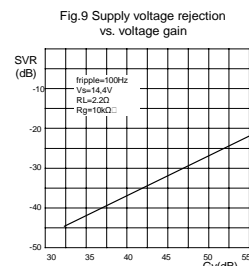
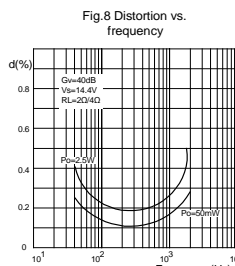
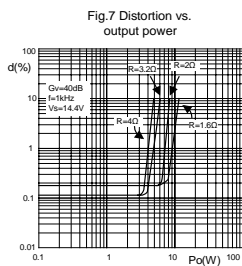
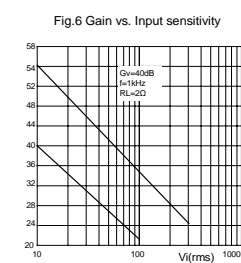
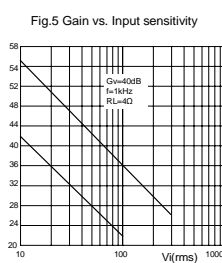
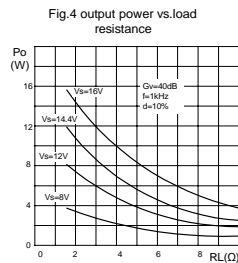
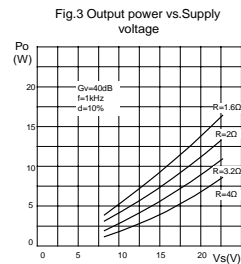
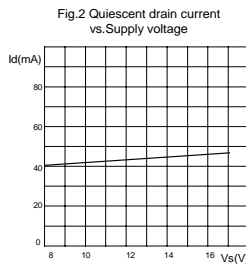
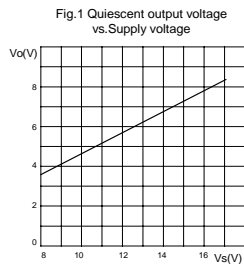
AC Test Circuit

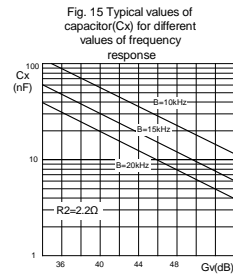
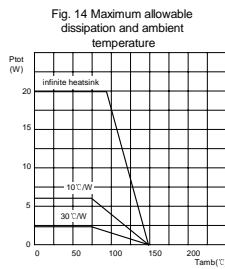
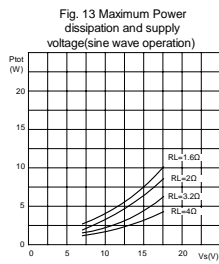
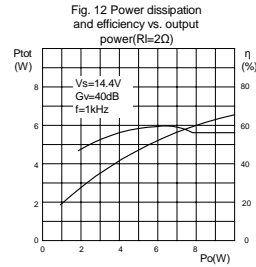
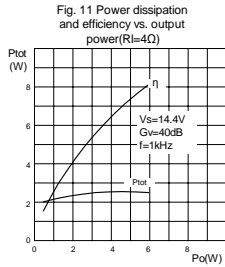
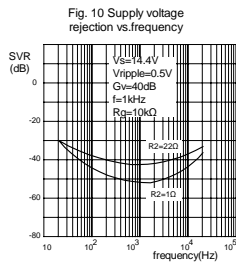
ELECTRICAL CHARACTERISTICS(Refer to the test circuit, $V_s=14.4V, T_a=25^\circ C$)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---------------------------|------------|-----------------------------------|-----|------|-------|------|
| DC CHARACTERISTICS | | | | | | |
| Supply Voltage | V_s | | 8 | | 18 | V |
| Quiescent Output Voltage | V_o | | 6.1 | 6.9 | 7.7 | V |
| Quiescent drain current | I_d | | | 44 | 50 | mA |
| AC CHARACTERISTICS | | | | | | |
| Output power | P_o | $d=10\%, f=1kHz$ | | | | W |
| | | $R_L=4\Omega$ | 5.5 | 6 | | |
| | | $R_L=2\Omega$ | 9 | 10 | | |
| | | $R_L=3.2\Omega$ | | 7.5 | | |
| Input sensitivity | V_i | $f=1kHz$ | | | | mV |
| | | $P_o=0.5W, R_L=4\Omega$ | | 14 | | |
| | | $P_o=6W, R_L=4\Omega$ | | 55 | | |
| | | $P_o=0.5W, R_L=2\Omega$ | | 10 | | |
| Input saturation voltage | $V_i(rms)$ | | 300 | | | mV |
| Frequency response(-3dB) | B | $P_o=1W, R_L=4\Omega$ | 40 | | 15000 | Hz |
| Distortion | D | $f=1kHz$ | | | | % |
| | | $P_o=0.05$ to $4.5W, R_L=4\Omega$ | | 0.15 | | |
| | | $P_o=0.05$ to $7.5W, R_L=2\Omega$ | | 0.15 | | |

(continued)

| PARAMETER | SYMBOL | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--------------------------|-----------------|--|------|-----|------|------|
| Input Resistance (pin 1) | R _i | open loop, f=1kHz | 70 | 150 | | kΩ |
| Input noise current | e _N | | | 60 | 200 | pA |
| Input noise voltage | I _N | | | 1 | 5 | μV |
| open loop voltage gain | G _{vo} | f=1kHz | | 80 | | dB |
| | | f=10kHz | | 60 | | dB |
| closed loop voltage gain | G _{vc} | f=1kHz, R _L =4Ω | 39.3 | 40 | 40.3 | dB |
| Efficiency | η | f=1kHz P _o =6W, R _L =4Ω | | 69 | | % |
| | | P _o =10W, R _L =2Ω | | 65 | | % |
| Supply voltage rejection | SVR | f=100Hz, V _{ripple} =0.5V R _g =10kΩ, R _L =4Ω | 30 | 36 | | dB |





APPLICATION INFORMATION

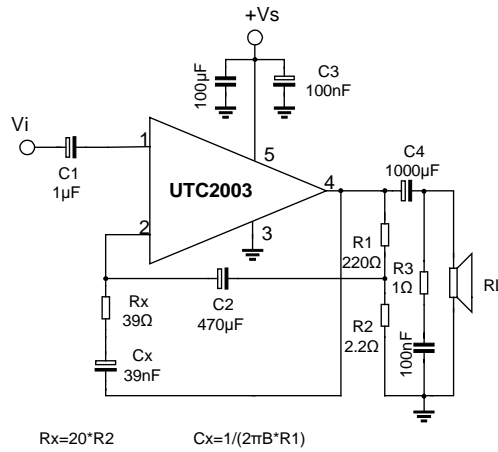


Fig 16 Typical application circuit

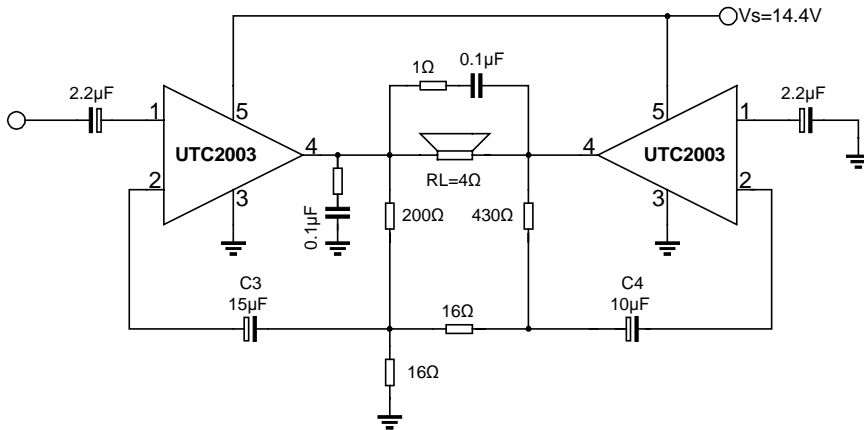


Fig.18 20W Bridge configuration application

The Values of the capacitors C3 and C4 are different to optimize the SVR(Typ. 40dB)

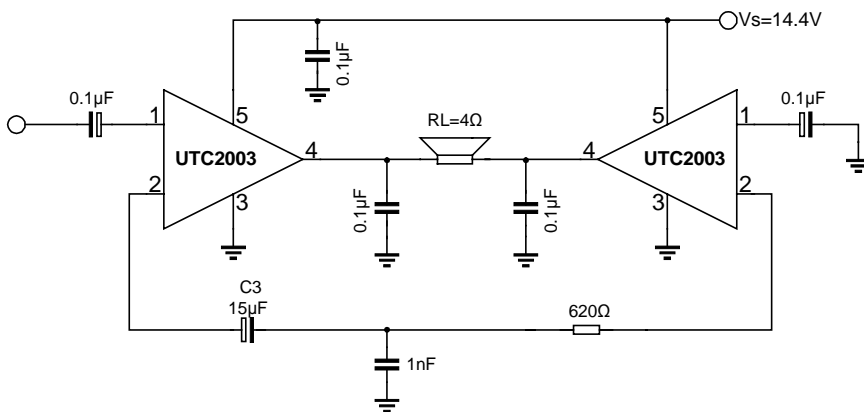


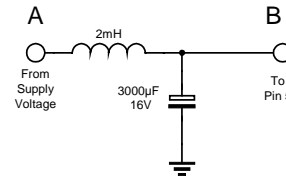
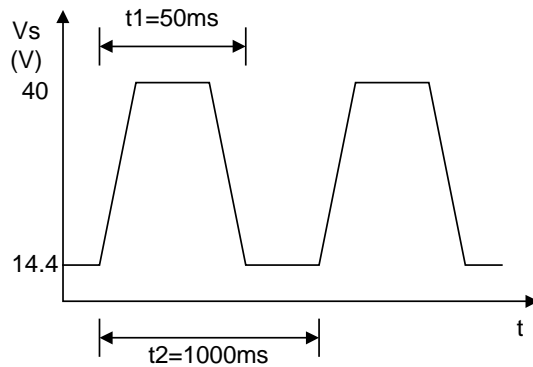
Fig.20 Low cost bridge configuration application circuit(Po=18W)

BUILT-IN PROTECTION SYSTEMS

Load dump voltage surge

The UTC2003 has a circuit which enables it to withstand a voltage pulse train, on pin 5, of the type shown in Fig. 23. If the supply voltage peaks to more than 40V, then an LC filter must be inserted between the supply and pin 5, in order to assure that the pulses at pin 5 will be head within the limits shown in Fig.22.

A suggested LC network is shown in Fig.23. With this network, a train of pulses with amplitude up to 120V and width of 2ms can be applied at point A. This type of protection is ON when the supply voltage(pulsed or DC) exceeds 18V. For this reason the maximum operating supply voltage is 18V.



Short Circuit (AC and DC Conditions)

The UTC2003 can withstand a permanent short-circuit on the output for a supply voltage up to 16V.

Polarity inversion

High current (up to 5A) can be handled by the device with no damage for a longer period than the blow-out time of a quick 1A fuse (normally connected in series with the supply).

The feature is added to avoid destruction if, during fitting to the car, a mistake on connection of the supply is made.

Open ground

When the radio is in the ON condition and the ground is accidentally opened, a standard audio amplifier will be damaged. On the UTC2003 protection diodes are included to avoid any damage.

Inductive load

A protection diode is provided between pin 4 and pin 5 (see the internal schematic diagram) to allow use of the UTC2003 with inductive loads. In particular, the UTC2003 can drive a coupling transformer for audio modulation.

DC voltage

The maximum operating DC voltage on the UTC2003 is 18V.

However the device can withstand a DC voltage up to 28V with no damage. This could occur during winter if two batteries were series connected to crank the engine.

Thermal shut-down

The presence of a thermal limiting circuit offers the following advantages:

- 1). an overload on the output (even if it is permanent), or an excessive ambient temperature can be easily withstood.
- 2). the heat-sink can have a smaller factor compared with that of a conventional circuit. There is no device damage in case of excessive junction temperature: all that happens is that P_o (and there P_{tot}) and I_d are reduced.

APPLICATION SUGGESTION

The recommended values of the components are those shown on application circuit of Fig.16. Different values can be used. The following table can help the designer.

| Component | Recommended value | Purpose | Large than recommended value | Large than recommended value |
|-----------|------------------------|-------------------------|---|---|
| R1 | $(Gv-1)*R2$ | gain setting. | | increase of Gain |
| R2 | 2.2Ω | gain and SVR setting. | Decrease of SVR | |
| R3 | 1Ω | Frequency stability | Danger of oscillation at high frequencies with inductive loads. | |
| Rx | $\approx 20*R2$ | Upper frequency cutoff | Poor high frequencies attenuation | Dange of oscillation |
| C1 | 2.2μF | Input DC decoupling | | Noise at switch-on switch-off |
| C2 | 470μF | Ripple rejection | | Decrease of SVR |
| C3 | 0.1μF | Supply voltage bypass | | Dange of oscillation |
| C4 | 1000μF | Output coupling to load | | Higher low frequency cutoff |
| C5 | 0.1μF | Frequency stability | | Danger of oscillation at high frequencies with inductive loads. |
| Cx | $\approx/(2 \pi*B*R1)$ | Upper frequency cutoff | smaller bandwidth | Larger bandwidth |