

DATA SHEET

TDA7000 FM radio circuit

Product specification
File under Integrated Circuits, IC01

May 1992

FM radio circuit**TDA7000****GENERAL DESCRIPTION**

The TDA7000 is a monolithic integrated circuit for mono FM portable radios, where a minimum on peripheral components is important (small dimensions and low costs).

The IC has an FLL (Frequency-Locked-Loop) system with an intermediate frequency of 70 kHz. The i.f. selectivity is obtained by active RC filters. The only function which needs alignment is the resonant circuit for the oscillator, thus selecting the reception frequency. Spurious reception is avoided by means of a mute circuit, which also eliminates too noisy input signals. Special precautions are taken to meet the radiation requirements.

The TDA7000 includes the following functions:

- R.F. input stage
- Mixer
- Local oscillator
- I.F. amplifier/limiter
- Phase demodulator
- Mute detector
- Mute switch

QUICK REFERENCE DATA

| | | | |
|---|----------|------------|-------------|
| Supply voltage range (pin 5) | V_P | 2,7 to 10 | V |
| Supply current at $V_P = 4,5$ V | I_P | typ. | 8 mA |
| R.F. input frequency range | f_{rf} | 1,5 to 110 | MHz |
| Sensitivity for -3 dB limiting (e.m.f. voltage) (source impedance: 75 Ω ; mute disabled) | EMF | typ. | 1,5 μ V |
| Signal handling (e.m.f. voltage) (source impedance: 75 Ω) | EMF | typ. | 200 mV |
| A.F. output voltage at $R_L = 22$ k Ω | V_o | typ. | 75 mV |

PACKAGE OUTLINE

18-lead DIL; plastic (SOT102HE); SOT102-1; 1996 July 24.

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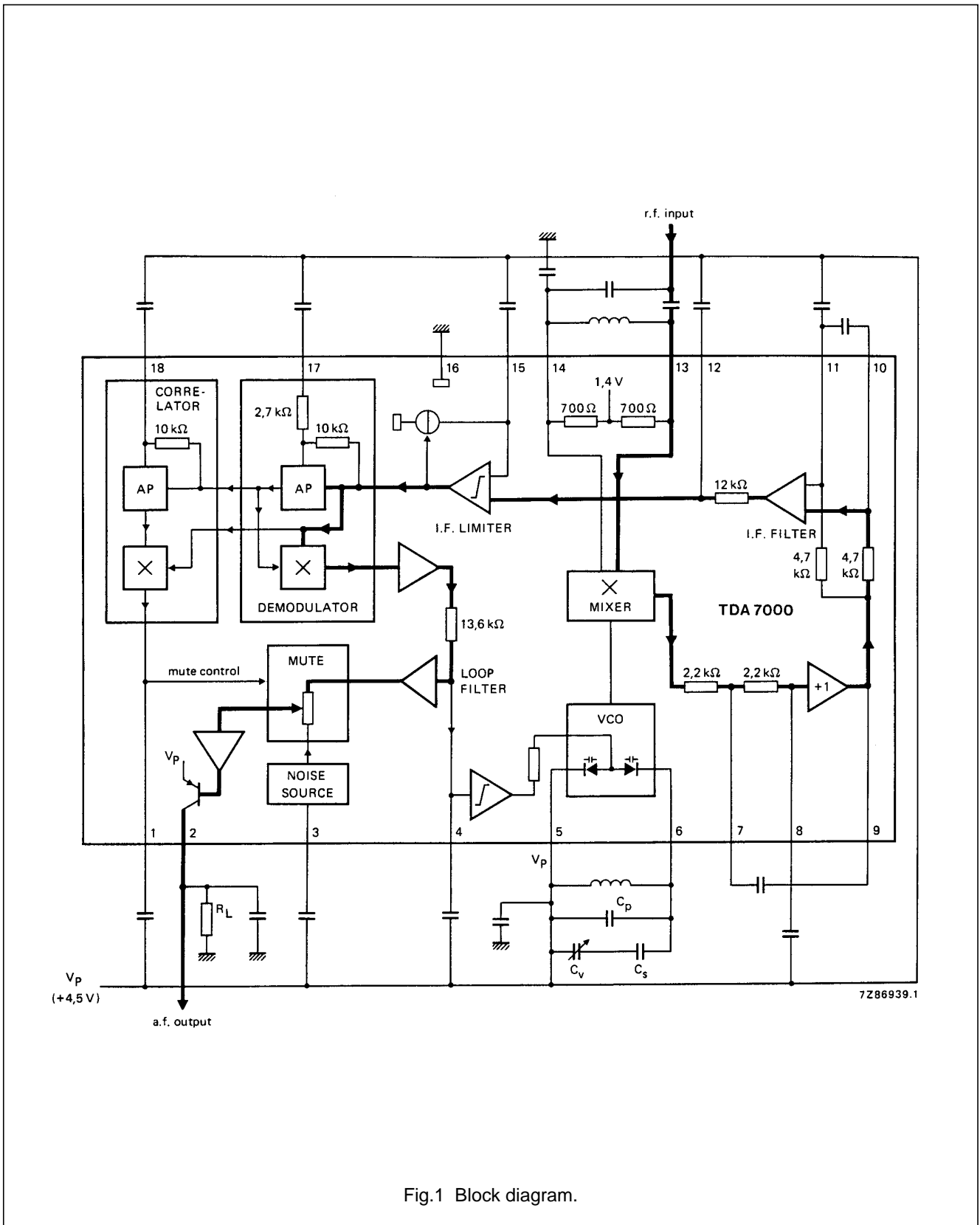


Fig.1 Block diagram.

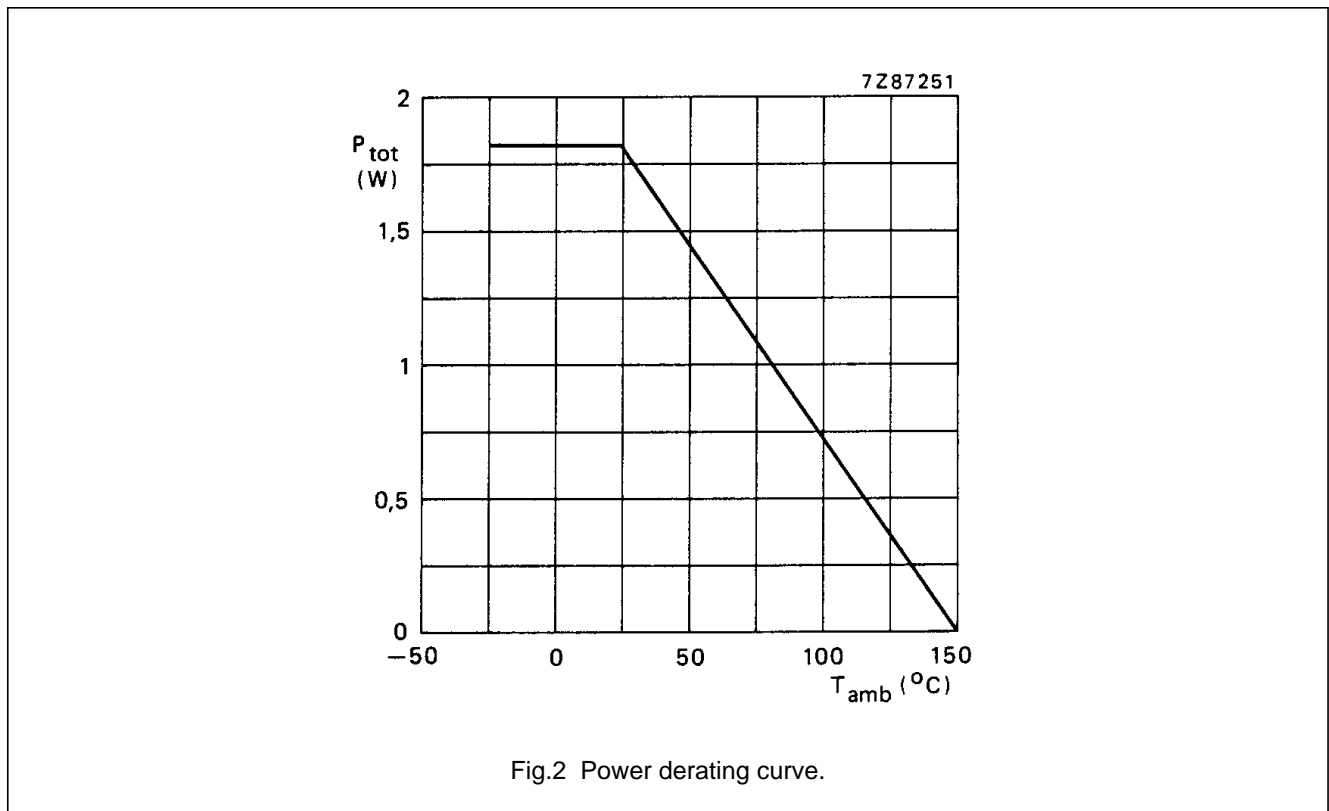
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RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

| | | | |
|-------------------------------------|--------------------------|----------------------------|------|
| Supply voltage (pin 5) | V_P | max. | 12 V |
| Oscillator voltage (pin 6) | V_{6-5} | $V_P - 0,5$ to $V_P + 0,5$ | V |
| Total power dissipation | see derating curve Fig.2 | | |
| Storage temperature range | T_{stg} | -55 to +150 °C | |
| Operating ambient temperature range | T_{amb} | 0 to +60 °C | |



D.C. CHARACTERISTICS

$V_P = 4,5$ V; $T_{amb} = 25$ °C; measured in Fig.4; unless otherwise specified

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|------------------------------------|-------------|------|------|------|------|
| Supply voltage (pin 5) | V_P | 2,7 | 4,5 | 10 | V |
| Supply current at $V_P = 4,5$ V | I_P | — | 8 | — | mA |
| Oscillator current (pin 6) | I_6 | — | 280 | — | μA |
| Voltage at pin 14 | V_{14-16} | — | 1,35 | — | V |
| Output current at pin 2 | I_2 | — | 60 | — | μA |
| Voltage at pin 2; $R_L = 22$ kΩ | V_{2-16} | — | 1,3 | — | V |

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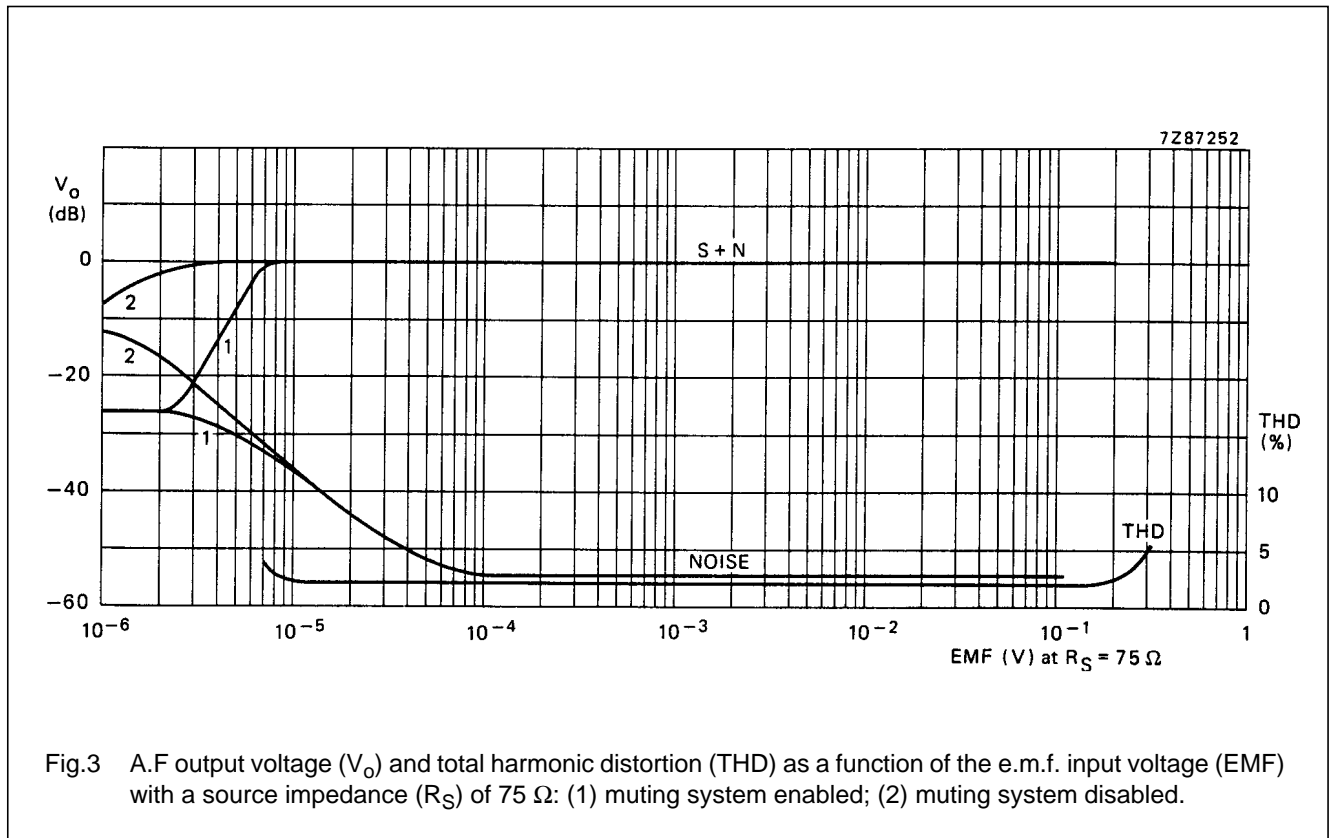
A.C. CHARACTERISTICS

$V_P = 4,5$ V; $T_{amb} = 25$ °C; measured in Fig.4 (mute switch open, enabled); $f_{rf} = 96$ MHz (tuned to max. signal at 5 μ V e.m.f.) modulated with $\Delta f = \pm 22,5$ kHz; $f_m = 1$ kHz; EMF = $0,2$ mV (e.m.f. voltage at a source impedance of 75 Ω); r.m.s. noise voltage measured unweighted ($f = 300$ Hz to 20 kHz); unless otherwise specified.

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|--|------------------|------|-----------|------|------------|
| Sensitivity (see Fig.3) (e.m.f. voltage) for -3 dB limiting; muting disabled | EMF | – | 1,5 | – | μ V |
| for -3 dB muting | EMF | – | 6 | – | μ V |
| for $S/N = 26$ dB | EMF | – | 5,5 | – | μ V |
| Signal handling (e.m.f. voltage) for $THD < 10\%$; $\Delta f = \pm 75$ kHz | EMF | – | 200 | – | mV |
| Signal-to-noise ratio | S/N | – | 60 | – | dB |
| Total harmonic distortion at $\Delta f = \pm 22,5$ kHz | THD | – | 0,7 | – | % |
| at $\Delta f = \pm 75$ kHz | THD | – | 2,3 | – | % |
| AM suppression of output voltage (ratio of the AM output signal referred to the FM output signal) FM signal: $f_m = 1$ kHz; $\Delta f = \pm 75$ kHz AM signal: $f_m = 1$ kHz; $m = 80\%$ | AMS | – | 50 | – | dB |
| Ripple rejection ($\Delta V_P = 100$ mV; $f = 1$ kHz) | RR | – | 10 | – | dB |
| Oscillator voltage (r.m.s. value) at pin 6 | $V_{6-5(rms)}$ | – | 250 | – | mV |
| Variation of oscillator frequency with supply voltage ($\Delta V_P = 1$ V) | Δf_{osc} | – | 60 | – | kHz/V |
| Selectivity | S_{+300} | – | 45 | – | dB |
| | S_{-300} | – | 35 | – | dB |
| A.F.C. range | Δf_{rf} | – | ± 300 | – | kHz |
| Audio bandwidth at $\Delta V_o = 3$ dB measured with pre-emphasis ($t = 50$ μ s) | B | – | 10 | – | kHz |
| A.F. output voltage (r.m.s. value) at $R_L = 22$ k Ω | $V_{o(rms)}$ | – | 75 | – | mV |
| Load resistance at $V_P = 4,5$ V | R_L | – | – | 22 | k Ω |
| at $V_P = 9,0$ V | R_L | – | – | 47 | k Ω |

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Conditions: $0 \text{ dB} = 75 \text{ mV}$; $f_{rf} = 96 \text{ MHz}$.
 for S + N curve: $\Delta f = \pm 22,5 \text{ kHz}$; $f_m = 1 \text{ kHz}$.
 for THD curve; $\Delta f = \pm 75 \text{ kHz}$; $f_m = 1 \text{ kHz}$.

Notes

1. The muting system can be disabled by feeding a current of about $20 \mu\text{A}$ into pin 1.
2. The interstation noise level can be decreased by choosing a low-value capacitor at pin 3. Silent tuning can be achieved by omitting this capacitor.

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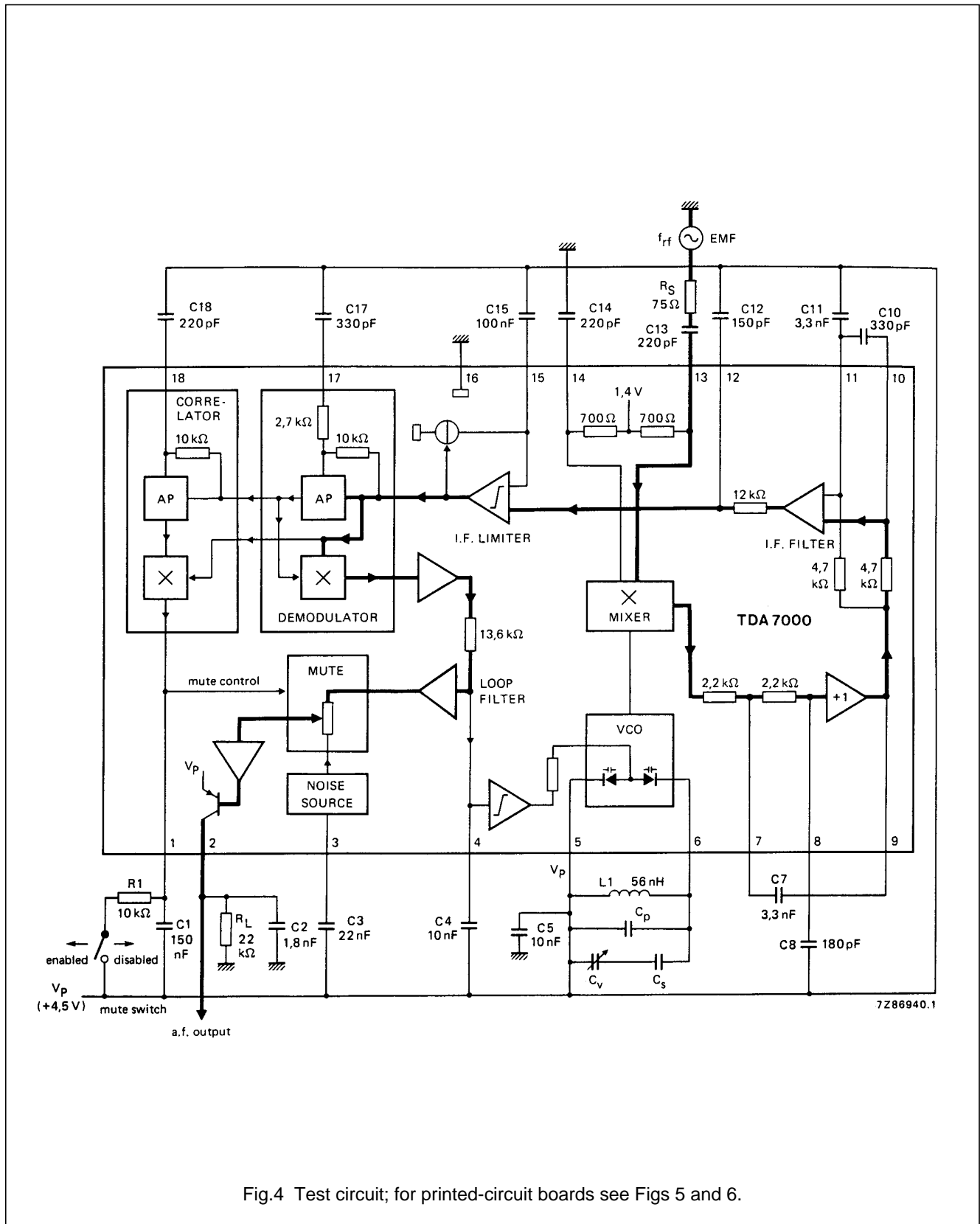
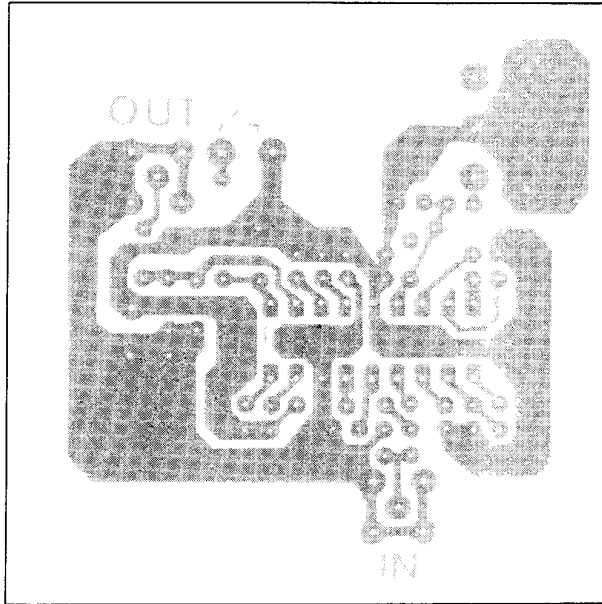


Fig.4 Test circuit; for printed-circuit boards see Figs 5 and 6.

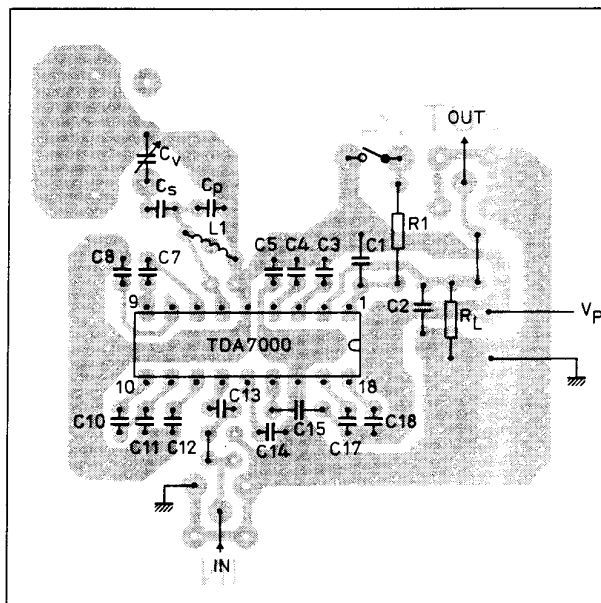
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7286938.1

Fig.5 Track side of printed-circuit board used for the circuit of Fig.4.



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Fig.6 Component side of printed-circuit board showing component layout used for the circuit of Fig.4.

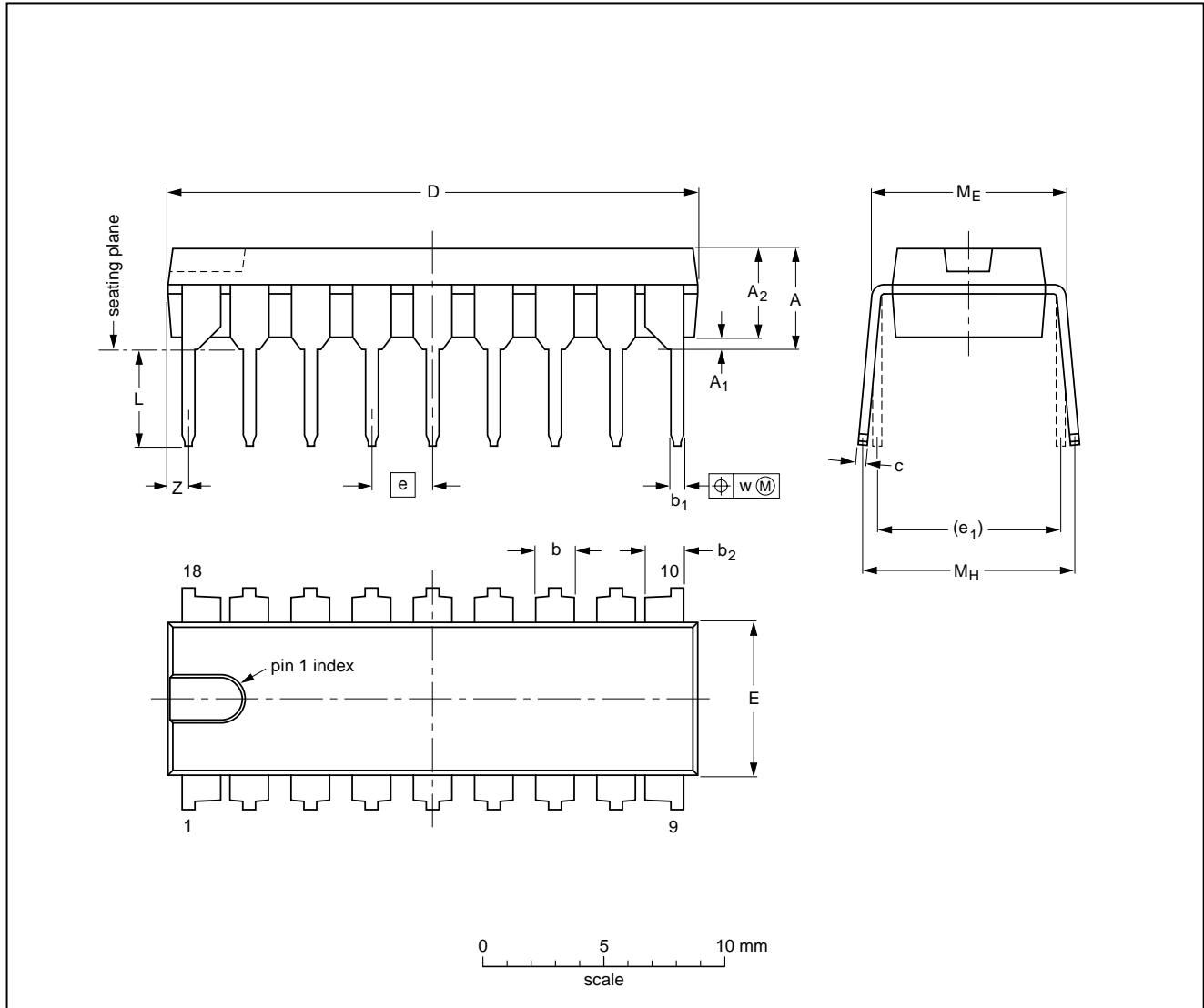
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PACKAGE OUTLINE

DIP18: plastic dual in-line package; 18 leads (300 mil)

SOT102-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT | A max. | A ₁ min. | A ₂ max. | b | b ₁ | b ₂ | c | D ⁽¹⁾ | E ⁽¹⁾ | e | e ₁ | L | M _E | M _H | w | Z ⁽¹⁾ max. |
|--------|--------|---------------------|---------------------|----------------|----------------|----------------|----------------|------------------|------------------|------|----------------|--------------|----------------|----------------|-------|-----------------------|
| mm | 4.7 | 0.51 | 3.7 | 1.40 1.14 | 0.53 0.38 | 1.40 1.14 | 0.32 0.23 | 21.8 21.4 | 6.48 6.20 | 2.54 | 7.62 | 3.9 3.4 | 8.25 7.80 | 9.5 8.3 | 0.254 | 0.85 |
| inches | 0.19 | 0.020 | 0.15 | 0.055 0.044 | 0.021 0.015 | 0.055 0.044 | 0.013 0.009 | 0.86 0.84 | 0.26 0.24 | 0.10 | 0.30 | 0.15 0.13 | 0.32 0.31 | 0.37 0.33 | 0.01 | 0.033 |

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT102-1 | | | | | | 93-10-14 95-01-23 |

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SOLDERING**Introduction**

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our "IC Package Databook" (order code 9398 652 90011).

Soldering by dipping or by wave

The maximum permissible temperature of the solder is 260 °C; solder at this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified maximum storage temperature ($T_{stg\ max}$). If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

Repairing soldered joints

Apply a low voltage soldering iron (less than 24 V) to the lead(s) of the package, below the seating plane or not more than 2 mm above it. If the temperature of the soldering iron bit is less than 300 °C it may remain in contact for up to 10 seconds. If the bit temperature is between 300 and 400 °C, contact may be up to 5 seconds.

DEFINITIONS

| Data sheet status | |
|---|---|
| Objective specification | This data sheet contains target or goal specifications for product development. |
| Preliminary specification | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification | This data sheet contains final product specifications. |
| Limiting values | |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. | |
| Application information | |
| Where application information is given, it is advisory and does not form part of the specification. | |

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