DATA SHEET

TDA7000
FM radio circuit

Product specification
File under Integrated Circuits, IC01

May 1992

Philips
Semiconductors

PHILIPS

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	μV
Signal handling (e.m.f. voltage)				
(source impedance: 75 Ω)	EMF	typ.	200	mV
A.F. output voltage at R_L = 22 kΩ	V_o	typ.	75	mV

PACKAGE OUTLINE

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

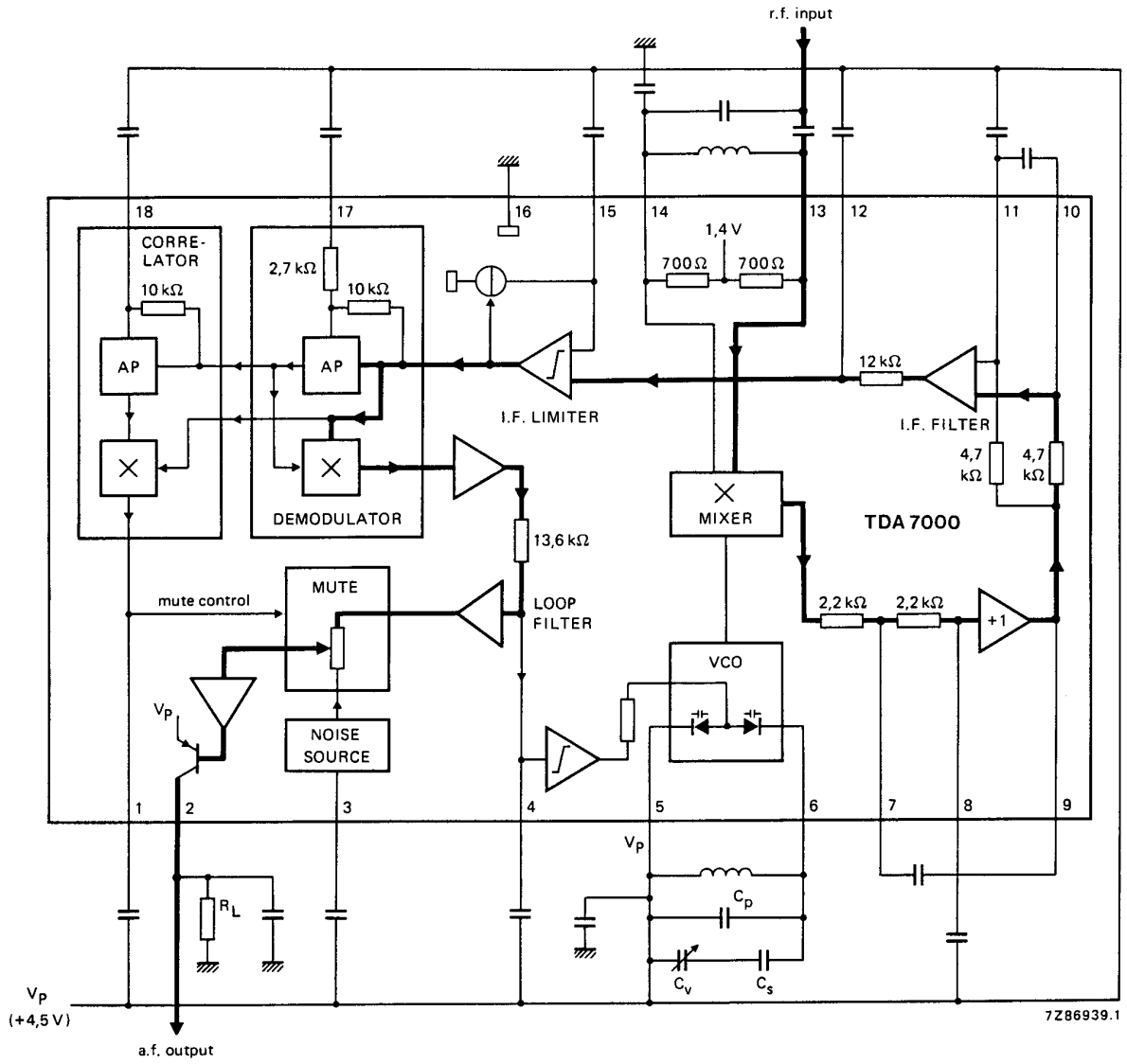


Fig.1 Block diagram.

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

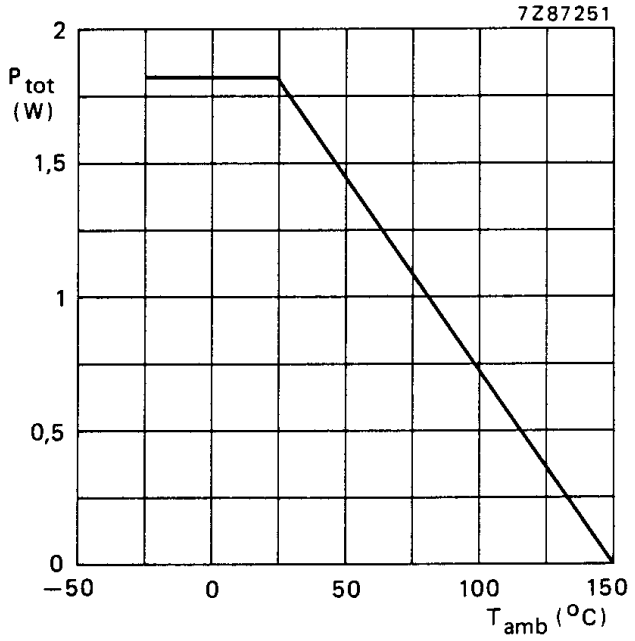


Fig.2 Power derating curve.

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

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 μV 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	–	μV
for –3 dB muting	EMF	–	6	–	μV
for S/N = 26 dB	EMF	–	5,5	–	μV
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 (ΔV_P = 100 mV;					
f = 1 kHz)	RR	–	10	–	dB
Oscillator voltage (r.m.s. value)					
at pin 6	$V_{6\text{-}5(rms)}$	–	250	–	mV
Variation of oscillator frequency					
with supply voltage (ΔV_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 ΔV_o = 3 dB					
measured with pre-emphasis (t = 50 μs)	B	–	10	–	kHz
A.F. output voltage (r.m.s. value)					
at R_L = 22 kΩ	$V_{o(rms)}$	–	75	–	mV
Load resistance					
at V_P = 4,5 V	R_L	–	–	22	kΩ
at V_P = 9,0 V	R_L	–	–	47	kΩ

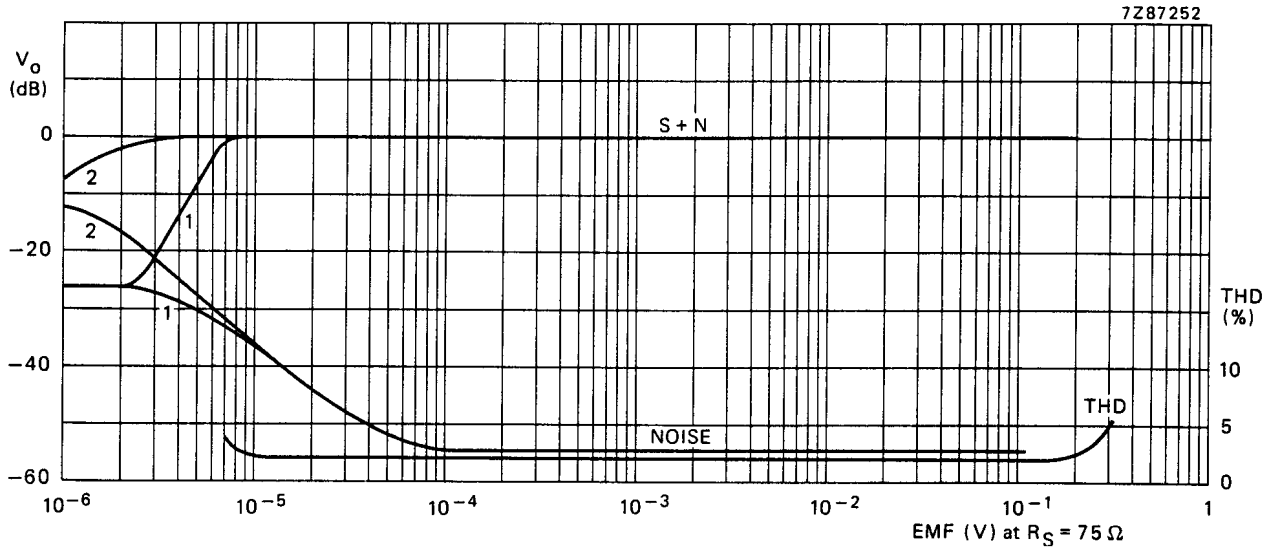


Fig.3 A.F output voltage (V_o) and total harmonic distortion (THD) as a function of the e.m.f. input voltage (EMF) with a source impedance (R_S) of 75 Ω: (1) muting system enabled; (2) muting system disabled.

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

Notes

1. The muting system can be disabled by feeding a current of about 20 μA 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.

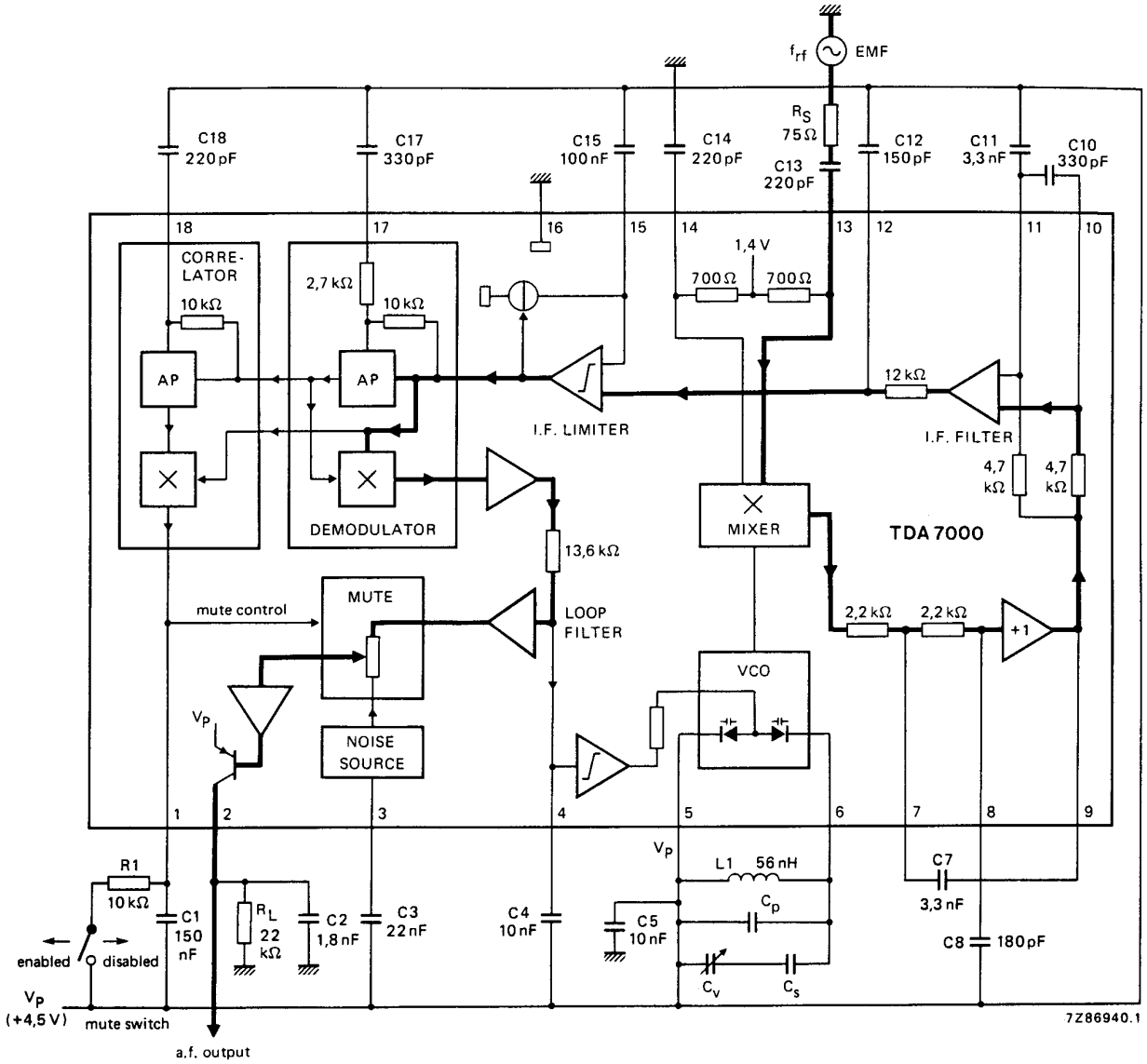


Fig.4 Test circuit; for printed-circuit boards see Figs 5 and 6.

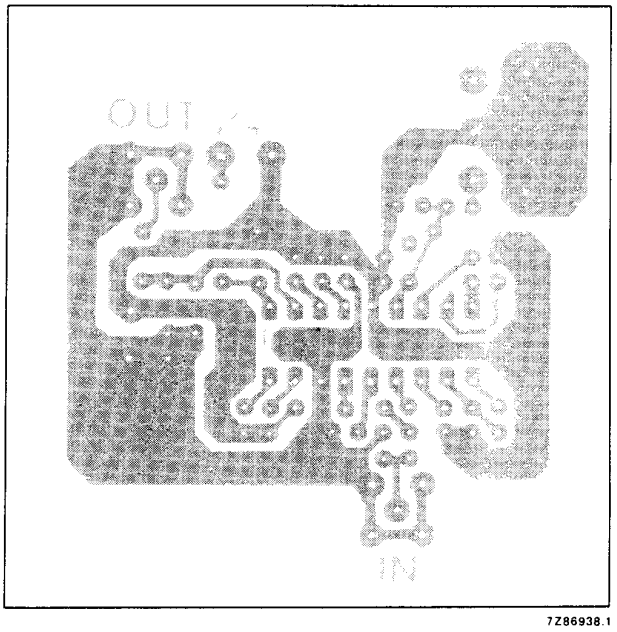


Fig.5 Track side of printed-circuit board used for the circuit of Fig.4.

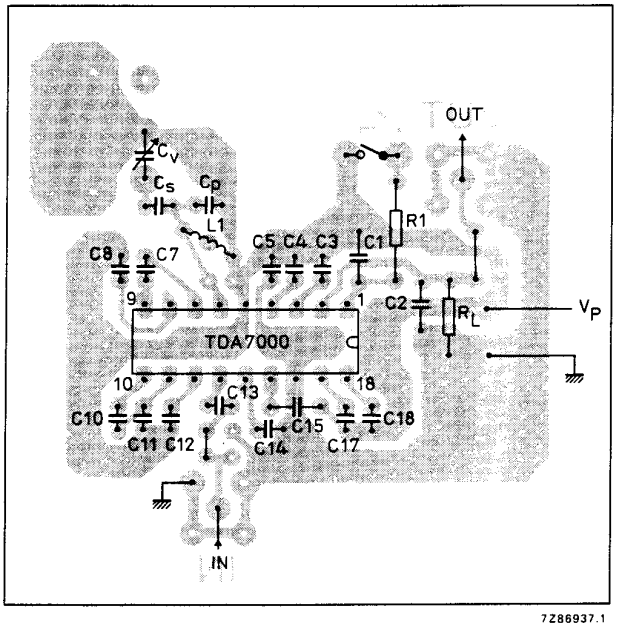
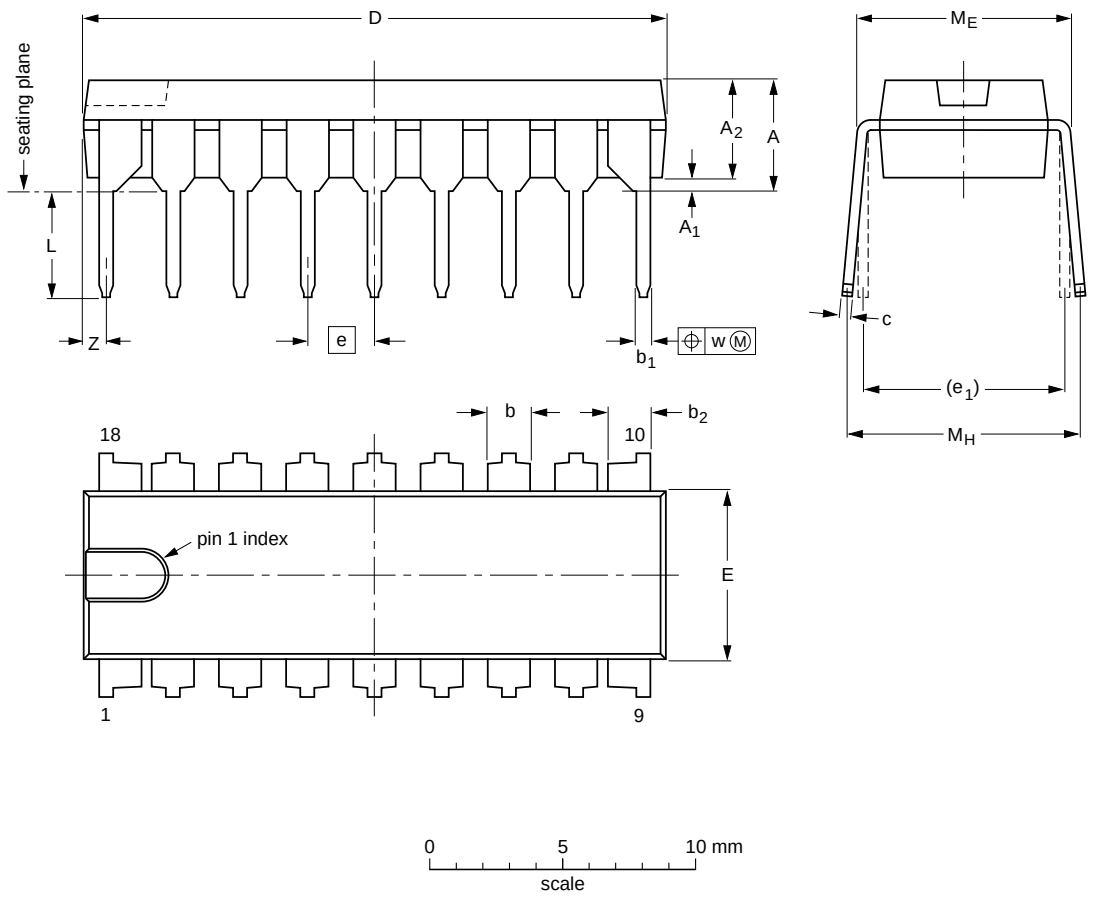


Fig.6 Component side of printed-circuit board showing component layout used for the circuit of Fig.4.

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

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.	

LIFE SUPPORT APPLICATIONS

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