DATA SHEET

TEA0676T
Dual pre-amplifier and equalizer for reverse tape decks

Product specification
Supersedes data of 1996 Jun 20
File under Integrated Circuits, IC01

1997 Oct 07

Dual pre-amplifier and equalizer for reverse tape decks

TEA0676T

FEATURES

- Dual head pre-amplifiers
- Reverse head switching
- Equalization with electronically switched time constants
- Output level like Dolby level of 387.5 mV = 0 dB
- Improved EMC behaviour.

GENERAL DESCRIPTION

The TEA0676T is a monolithic bipolar integrated circuit intended for applications in car radios. It includes head and equalization amplifiers with electronically switchable time constants. Furthermore it includes electronically switchable inputs for tape drivers with reverse heads.

The device will operate with power supplies in a range of 7.6 to 12.0 V. The output overload level increases with the increase in supply voltage, so it is advisable to use a regulated power supply or a supply with a long time constant.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CC}	supply voltage		7.6	10	12	V
I_{CC}	supply current	V_{CC} = 10 V	–	10	13	mA
$\frac{S+N}{N}$	signal plus noise-to-noise ratio	unweighted RMS value	67	73	–	dB
$V_{o\,(rms)}$	output voltage (0 dB) (RMS value)	gain internal = 40 dB; linear	–	387.5	–	mV

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TEA0676T	SO16	plastic small outline package; 16 leads; body width 7.5 mm	SOT162-1

BLOCK DIAGRAM

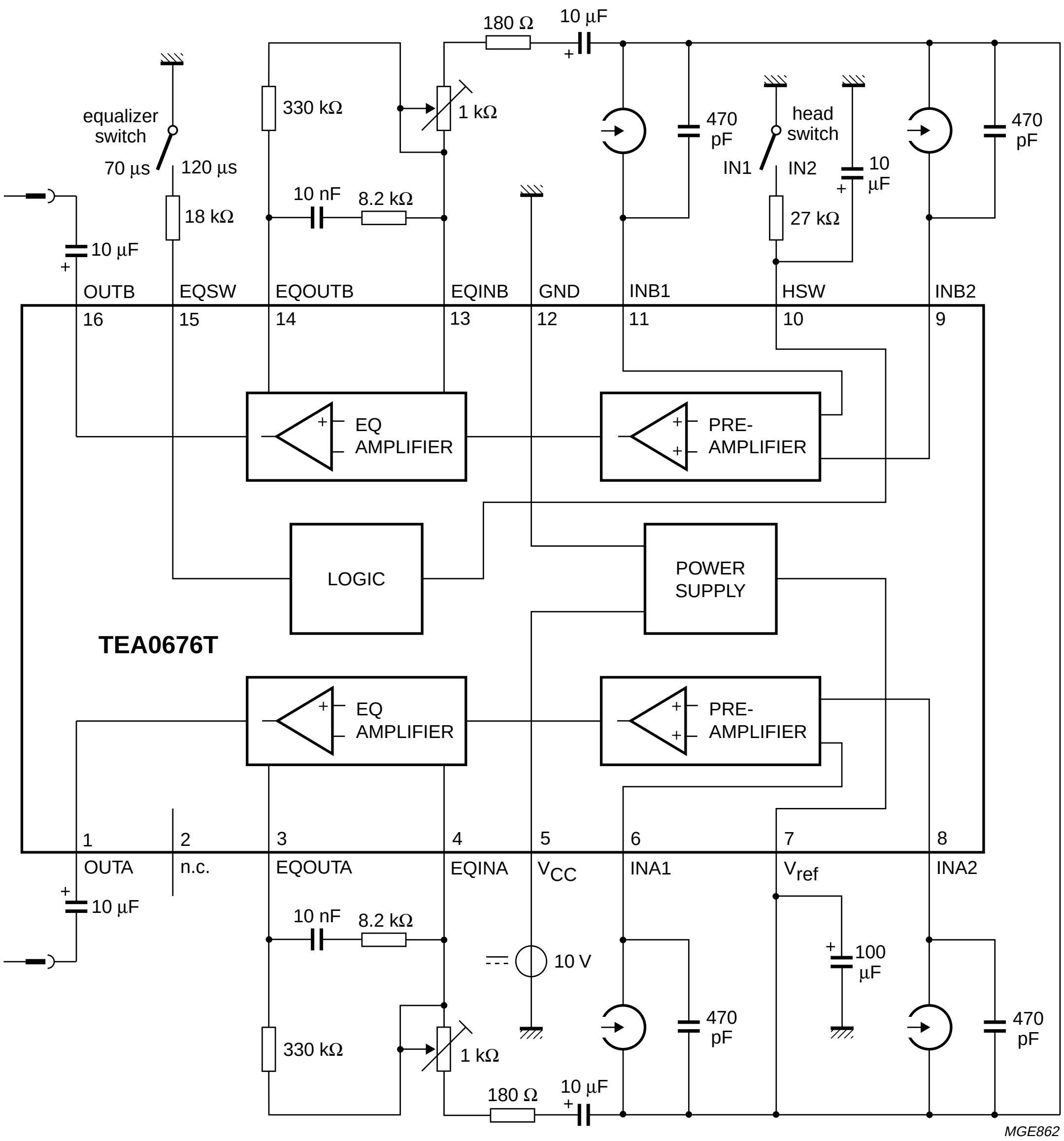


Fig.1 Block and application diagram.

PINNING

SYMBOL	PIN	DESCRIPTION
OUTA	1	output channel A
n.c.	2	not connected
EQOUTA	3	output equalizer channel A
EQINA	4	input equalizer channel A
V_{CC}	5	supply voltage
INA1	6	input channel A1 (forward or reverse)
V_{ref}	7	reference voltage
INA2	8	input channel A2 (reverse or forward)
INB2	9	input channel B2 (reverse or forward)
HSW	10	input head switch
INB1	11	input channel B1 (forward or reverse)
GND	12	ground
EQINB	13	input equalizer channel B
EQOUTB	14	output equalizer channel B
EQSW	15	input equalizer switch
OUTB	16	output channel B

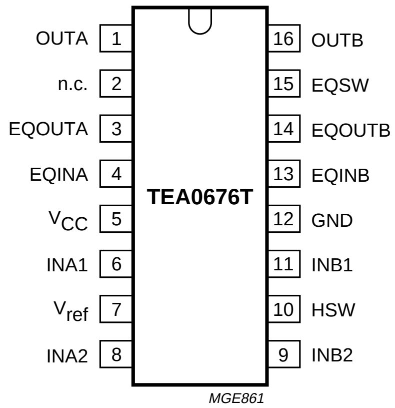


Fig.2 Pin configuration.

FUNCTIONAL DESCRIPTION

Gain of pre-amplifier = 30 dB; minimum gain of EQ-amplifier = 24.5 dB at f = 1 kHz with 70 µs cut-off frequency.

Head switching is achieved when pin 10 (HSW) is connected to ground via a 27 kΩ resistor (inputs INA2, INB2 are active) or connected to HIGH level (0.8V_{CC}) (inputs INA1, INB1 are active).

Equalization time constant switching (70 µs/120 µs) is achieved when pin 15 (EQSW) is connected to ground via an 18 kΩ resistor (120 µs) or left open-circuit (70 µs).

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	supply voltage		0	14	V
$\Delta V_{(12-x)}$	voltage at pins 1 to 11, 13 to 16 with respect to pin 12		0	V_{CC}	V
T_{stg}	storage temperature		–55	+150	°C
T_{amb}	operating ambient temperature		–40	+85	°C
V_{es}	electrostatic handling voltage	note 1	–2000	+2000	V
		note 2	–500	+500	V

Notes

1. Human body model: C = 100 pF; R = 1.5 kΩ.
2. Machine model: C = 200 pF; R = 0 Ω.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient in free air	70	K/W

CHARACTERISTICS

V_{CC} = 10 V; R_L = 10 kΩ; C_L = 2.5 nF; T_{amb} = 25 °C; V_o = 0 dB means 387.5 mV at output; all levels are referenced to 387.5 mV with 0 dB as standard; EQ switch in 70 µs position; unless otherwise specified; see notes 1 and 2.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply						
V_{CC}	supply voltage (pin 5)		7.6	10.0	12.0	V
I_{CC}	supply current		–	10	13	mA
THD	total harmonic distortion	f = 1 kHz; V_o = 0 dB	–	0.08	0.15	%
		f = 10 kHz; V_o = 6 dB	–	0.15	0.3	%
H_R	headroom at output	V_{CC} = 7.6 V; THD = 1%; f = 1 kHz	12	–	–	dB
PSRR	power supply ripple rejection	$V_{R(rms)}$ < 0.25 V; f = 1 kHz	–	50	–	dB
α_{cs}	channel separation	selective measurement; f = 1 kHz; V_o = 10 dB	57	63	–	dB
α_m	channel matching	selective measurement; f = 1 kHz; V_o = 0 dB	–0.5	–	+0.5	dB
α_{ct}	crosstalk between active and inactive input	selective measurement; f = 1 kHz; V_o = 10 dB	70	77	–	dB
$\frac{S+N}{N}$	signal plus noise-to-noise ratio (RMS value)	unweighted; f = 20 Hz to 20 kHz; R_S = 0 Ω; internal gain 40 dB; linear; see Fig.13	67	73	–	dB
$V_{no(rms)}$	equivalent input noise voltage (RMS value)	unweighted; f = 20 Hz to 20 kHz; R_S = 0 Ω	–	0.8	–	µV
G_v	voltage gain of pre-amplifier	from pin INA1 or INA2 to pin EQINA and from pin INB1 or INB2 to pin EQINB	29	30	31	dB
A_v	open-loop amplification	pin INA1 to pin OUTA and pin INB1 to pin OUTB				
		f = 10 kHz	80	86	–	dB
		f = 400 Hz	104	110	–	dB
R_{EQ}	equalization resistor		4.7	5.8	6.9	kΩ
Z_I	input impedance pre-amplifier		60	100	–	kΩ
Z_O	output impedance EQ-amplifier		–	80	100	Ω
R_L	output load resistance		10	–	–	kΩ
C_L	output load capacitance		0	–	10	nF
$V_{offset(DC)}$	input offset voltage	pins INA1, INA2, INB1 and INB2 connected to V_{ref}	–	2	–	mV
$I_{O(GND)}$	DC current capability	output to ground	–2	–	–	mA
$I_{O(VCC)}$	DC current capability	output to V_{CC}	300	–	–	µA
EMC	DC offset voltage at pins 1 and 16	f = 900 MHz; V_i = 6 V (RMS); see Figs 12, 14 and 15	–	50	–	mV

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Switching thresholds						
EQUALIZATION TIME CONSTANT SWITCHING						
V_{EQSW}	pin voltage	load current +100 to –100 μA	–	$0.8V_{CC}$	–	V
I_{EQSW}	input current	V_{EQSW} = 0 to V_{CC}	–180	–	+180	μA
$V_{EQSW(HIGH)}$	pin voltage	time constant 70 μs active	$\frac{1}{2}V_{CC}$ + 0.5	–	V_{CC}	V
$V_{EQSW(LOW)}$	pin voltage	time constant 120 μs active	0	–	$\frac{1}{2}V_{CC}$ – 0.5	V
HEAD SWITCHING						
V_{HSW}	pin voltage	load current +90 to –90 μA	–	$0.8V_{CC}$	–	V
I_{HSW}	input current	V_{HSW} = 0 to V_{CC}	–170	–	+170	μA
$V_{HSW(HIGH)}$	HIGH-level pin voltage	inputs INA1 and INB1 active	$\frac{1}{2}V_{CC}$ + 0.5	–	V_{CC}	V
$V_{HSW(LOW)}$	LOW-level pin voltage	inputs INA2 and INB2 active	0	–	$\frac{1}{2}V_{CC}$ – 0.5	V

Notes

1. For an application with a fixed equalization time constant of 120 μs the equalizing network may be applied completely external. In this application the 8.2 kΩ resistor has to be changed to 14 kΩ and the internal resistor R_{EQ} = 5.8 kΩ must be short-circuited by fixing the equalization switch input at 70 μs (pin 15 left open-circuit). To activate the inputs INA1 and INB1, pin 10 (HSW) might be left open-circuit. In this event the DC level at pin 10 (HSW) is $0.8V_{CC}$
2. It is recommended to switch off V_{CC} with a gradient of 400 V/s at maximum to avoid plops on the tape in the event of contact between tape and tape head while switching off.

INTERNAL PIN CONFIGURATIONS

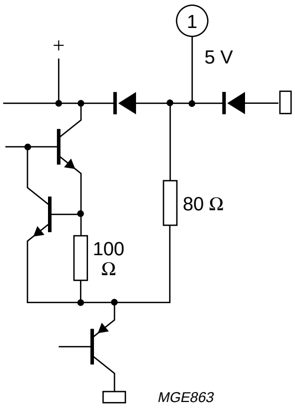


Fig.3 Pins 1 and 16: output channel.

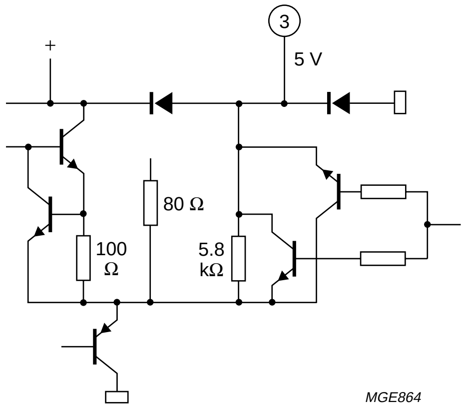


Fig.4 Pins 3 and 14: equalizer outputs.

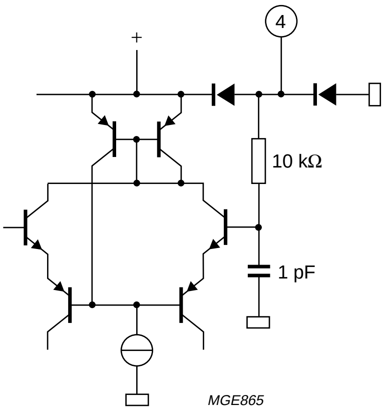


Fig.5 Pins 4 and 13: equalizer inputs.

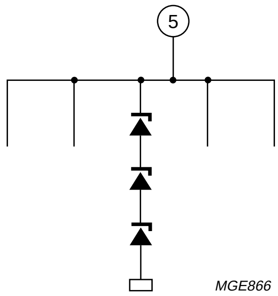


Fig.6 Pin 5: supply voltage.

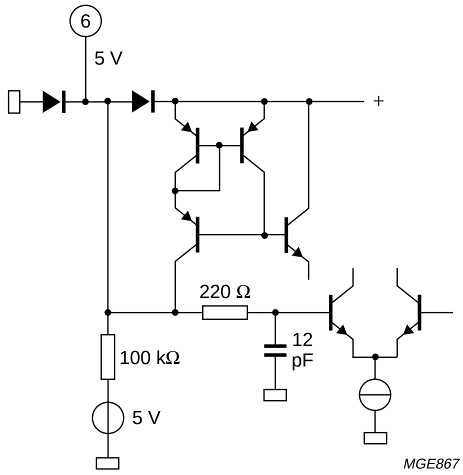


Fig.7 Pins 6, 8, 9, 11: input channel.

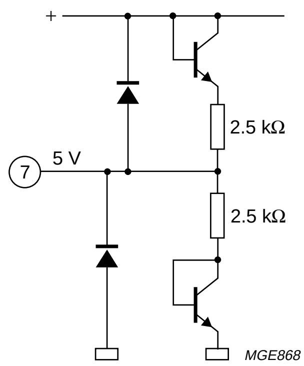


Fig.8 Pin 7: reference voltage.

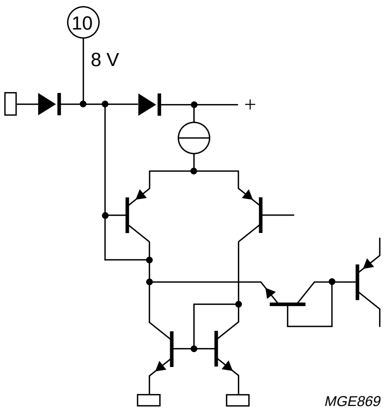


Fig.9 Pin 10: input head switch.

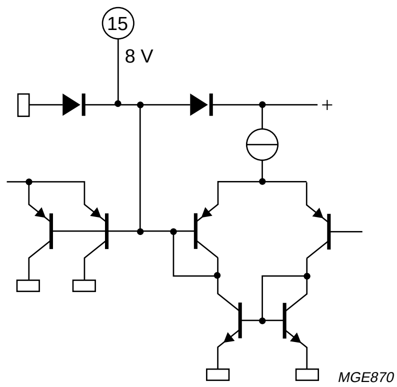


Fig.10 Pin 15: input equalizer switch.

TEST AND APPLICATION INFORMATION

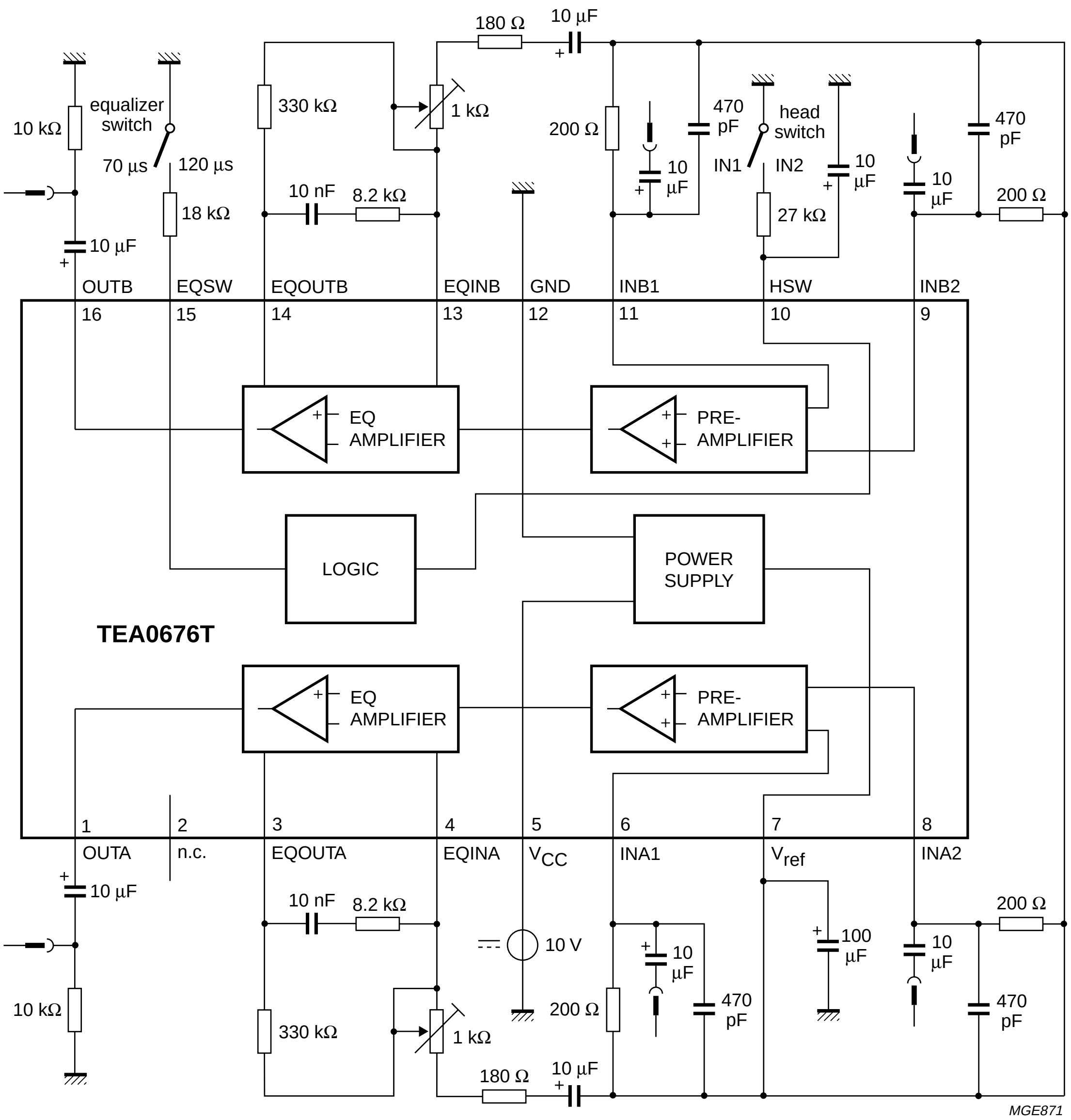


Fig.11 Test circuit.

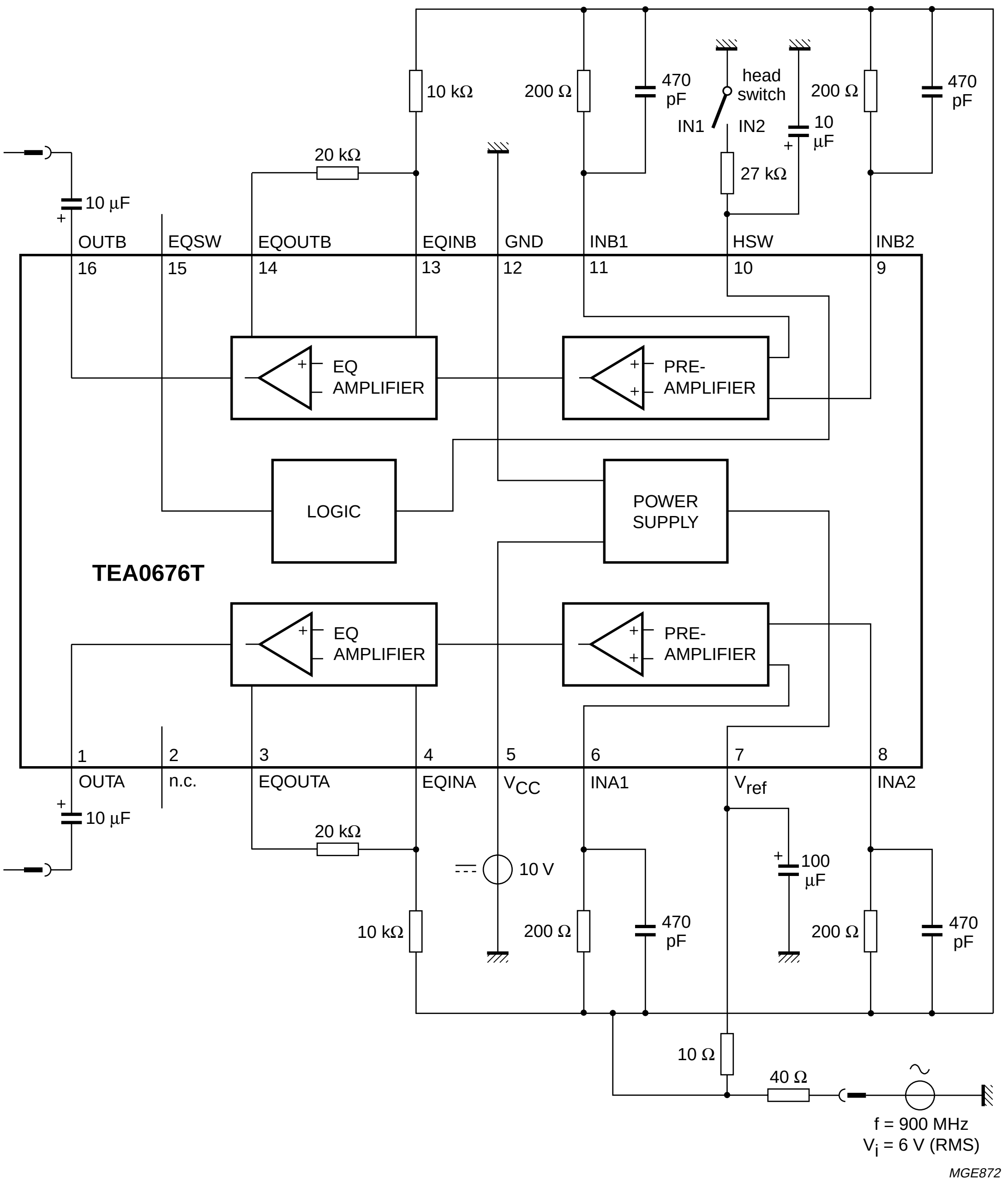


Fig.12 EMC test diagram.

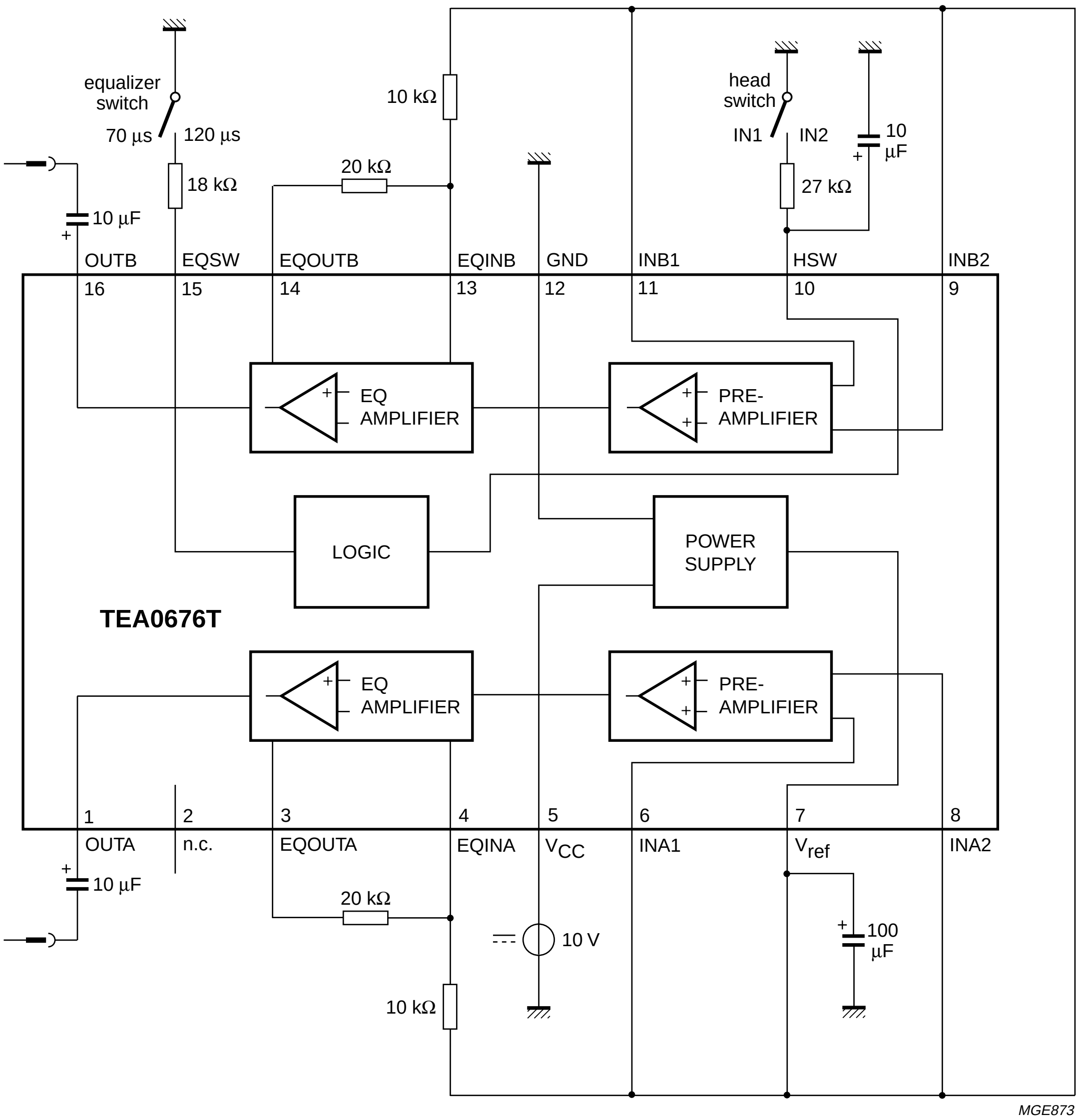
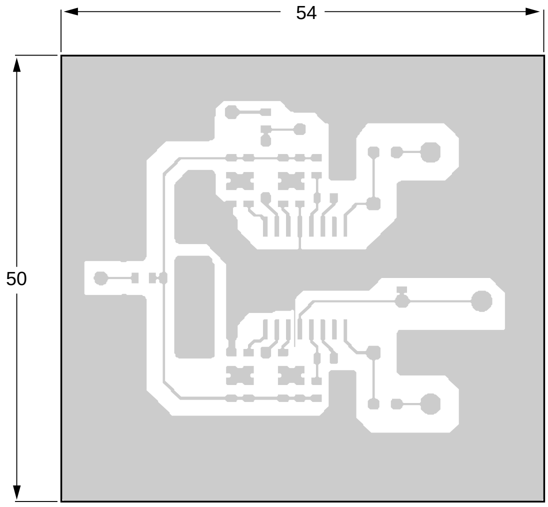


Fig.13 Noise test diagram.

LAYOUT OF PRINTED CIRCUIT BOARD FOR EMC TEST CIRCUIT



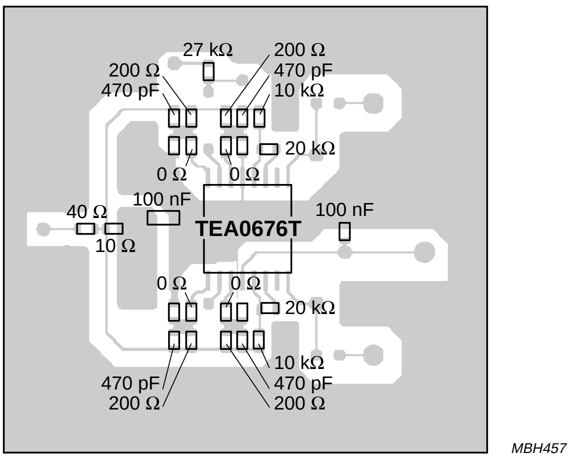
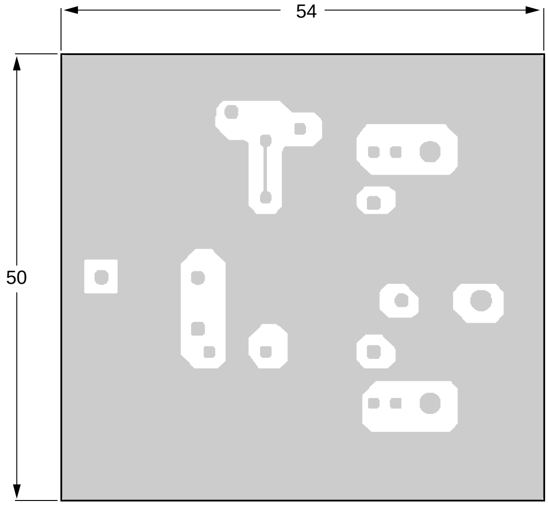


Fig.14 Top side with components.



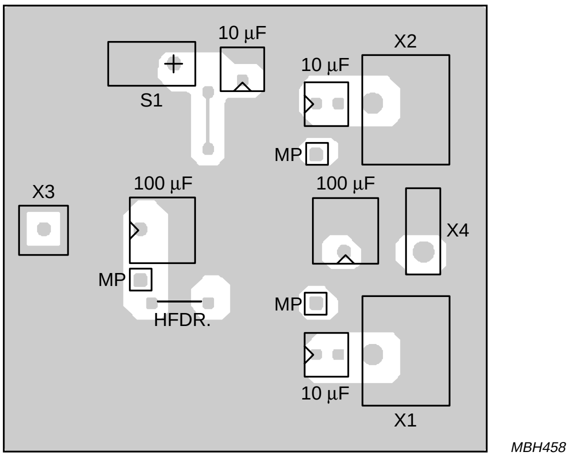
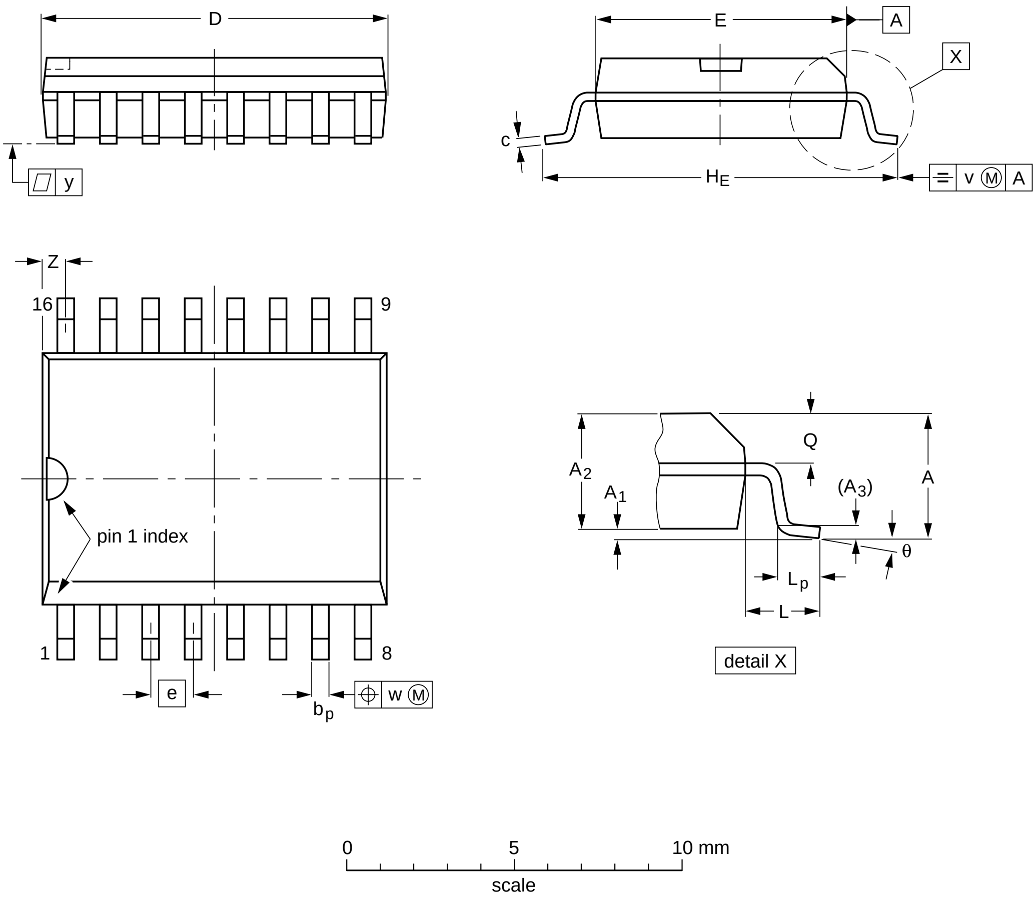


Fig.15 Bottom side with components.

PACKAGE OUTLINE

SO16: plastic small outline package; 16 leads; body width 7.5 mm **SOT162-1**



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

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (1)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	10.5 10.1	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8^o 0^o
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.41 0.40	0.30 0.29	0.050	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT162-1	075E03	MS-013AA				~~95-01-24~~ 97-05-22

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).

Reflow soldering

Reflow soldering techniques are suitable for all SO packages.

Reflow soldering requires solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the printed-circuit board by screen printing, stencilling or pressure-syringe dispensing before package placement.

Several techniques exist for reflowing; for example, thermal conduction by heated belt. Dwell times vary between 50 and 300 seconds depending on heating method. Typical reflow temperatures range from 215 to 250 °C.

Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 minutes at 45 °C.

Wave soldering

Wave soldering techniques can be used for all SO packages if the following conditions are observed:

- A double-wave (a turbulent wave with high upward pressure followed by a smooth laminar wave) soldering technique should be used.
- The longitudinal axis of the package footprint must be parallel to the solder flow.
- The package footprint must incorporate solder thieves at the downstream end.

During placement and before soldering, the package must be fixed with a droplet of adhesive. The adhesive can be applied by screen printing, pin transfer or syringe dispensing. The package can be soldered after the adhesive is cured.

Maximum permissible solder temperature is 260 °C, and maximum duration of package immersion in solder is 10 seconds, if cooled to less than 150 °C within 6 seconds. Typical dwell time is 4 seconds at 250 °C.

A mildly-activated flux will eliminate the need for removal of corrosive residues in most applications.

Repairing soldered joints

Fix the component by first soldering two diagonally-opposite end leads. Use only a low voltage soldering iron (less than 24 V) applied to the flat part of the lead. Contact time must be limited to 10 seconds at up to 300 °C. When using a dedicated tool, all other leads can be soldered in one operation within 2 to 5 seconds between 270 and 320 °C.

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

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

NOTES

NOTES

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