DATA SHEET

TEA1083; TEA1083A
Call progress monitor for line powered telephone sets

Product specification
File under Integrated circuits, IC03A

March 1994

Philips Semiconductors

PHILIPS

Call progress monitor for line powered telephone sets

TEA1083; TEA1083A

FEATURES

- Internal supply
  - Optimum current split-up
  - Low constant current (adjustable) in transmission IC
  - Nearly all line current available for monitoring
  - Stabilized supply voltage
- Loudspeaker amplifier with a fixed gain of 35 dB
- Volume controlled by potentiometer
- Power-down input (TEA1083A only)
- Loudspeaker enable input.

GENERAL DESCRIPTION

The TEA1083/83A is a bipolar IC which has been designed for use in line powered telephone sets. It is intended to offer a monitoring facility of the line signal via a loudspeaker during on-hook dialling. The TEA1083/83A is intended for use in conjunction with a transmission circuit of the TEA1060 family. The device uses a part of the available line current via the internal supply circuit.

The loudspeaker amplifier, which consists of a preamplifier and a power amplifier, amplifies the received line signals from the transmission circuit when enabled via the LSE input. The loudspeaker amplifier can also be used to amplify dialling tones from the dialler IC. The power amplifier contains a push-pull output stage to drive the loudspeaker in a Single Ended Load (SEL) configuration. The internal voltage stabilizer can be used to supply external devices. By activating the power-down (PD) input of the TEA1083A, the current consumption of the circuit will be reduced, this enables pulse dialling or flash (register recall).

An internal start circuit ensures normal start-up of the transmission IC.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{SUP}	input current range		3.0	–	120	mA
V_{BB}	stabilized supply current		–	2.95	–	V
I_{SUP}	current consumption	PD = HIGH; TEA1083A only	–	50	–	µA
G_v	voltage gain of loudspeaker amplifier		–	35	–	dB
I_{SUP}	minimum input current	P_O = 10 mW (typ) into 50 Ω	–	10	–	mA
T_{amb}	operating ambient temperature range		–25	–	+75	°C

ORDERING INFORMATION

EXTENDED TYPE NUMBER	PACKAGE			
	PINS	PIN POSITION	MATERIAL	CODE
TEA1083	8	DIL	PLASTIC	SOT97D(1)
TEA1083A	16	DIL	PLASTIC	SOT38(2)
TEA1083AT	16	SOL	PLASTIC	SOT162AG(3)

Notes

1. SOT97-1; 1998 Jun 18.
2. SOT38-1; 1998 Jun 18.
3. SOT162-1; 1998 Jun 18.

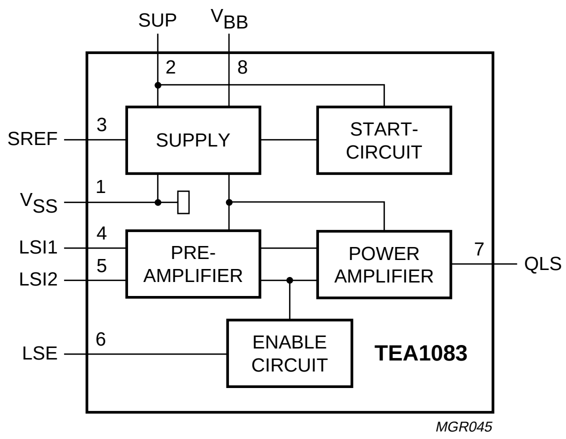


Fig.1 Block diagram (TEA1083).

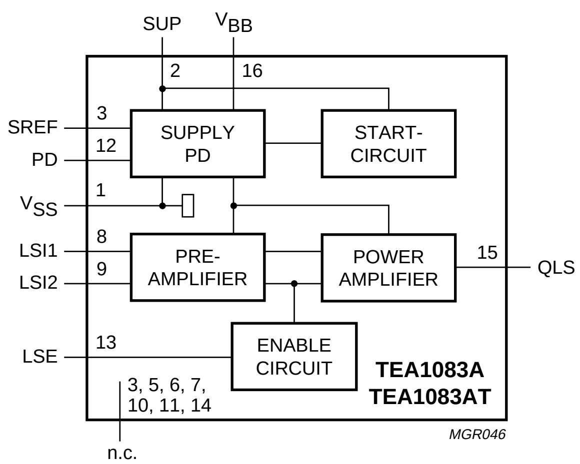


Fig.2 Block diagram (TEA1083A/AT).

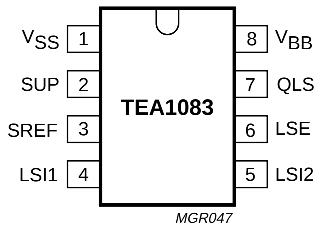


Fig.3 Pin configuration (TEA1083).

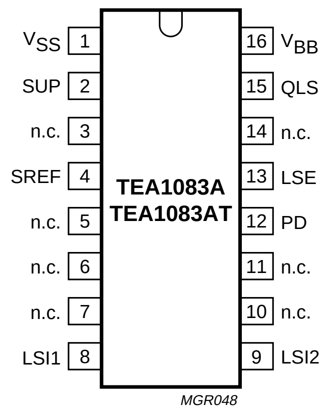


Fig.4 Pin configuration (TEA1083A/AT).

PINNING

SYMBOL	PIN DIL16	PIN DIL8	DESCRIPTION
V_{SS}	1	1	negative supply terminal
SUP	2	2	positive supply terminal
n.c.	3	–	not connected
SREF	4	3	supply reference input
n.c.	5	–	not connected
n.c.	6	–	not connected
n.c.	7	–	not connected
LSI1	8	4	loudspeaker amplifier input 1
LSI2	9	5	loudspeaker amplifier input 2
n.c.	10	–	not connected
n.c.	11	–	not connected
PD	12	–	power-down input
LSE	13	6	loudspeaker enable input
n.c.	14	–	not connected
QLS	15	7	loudspeaker amplifier output
V_{BB}	16	8	stabilized supply voltage

Table 1 Comparison of the TEA108X family.

PRODUCT	CONDITIONS	TEA1083	TEA1083A	TEA1085/85A
Application area	note 1	call progress monitoring		listening-in
PD facility		–	X	X
MUTE or LSE facility	note 2	X	X	X
Dynamic limiter		–	–	X
Howling limiter		–	–	X
V_{BB} setting		–	–	X
SEL	note 3	X	X	X
BTL	note 3	–	–	X
Number of pins	note 4	8	16	24

Notes

1. A call progress monitor is recommended by the European Telecommunications Standards Institute (ETSI) for telephone sets with automatic on-hook dialling facilities so that audible, or visual, progress of a call attempt can be monitored. In accordance with the ETSI (at a frequency of 440 Hz and a line level of 20 dBm (600 Ω)), a minimum level of 50 dBA shall be guaranteed at a distance of 50 cm from the set. This corresponds to a minimum level of approximately 100 mV (RMS) ($P_O \geq 0.2$ mW) across a loudspeaker; Philips type AD2071/Z50.

   A listening-in set has to offer the user more facilities e.g. howling limiting to reduce annoying loudspeaker and line signals. Dynamic limiting of the loudspeaker signal, with respect to supply conditions, can also be required. Acoustic output levels for listening-in sets are approximately 70 to 75 dBA. This corresponds to a loudspeaker level of approximately 1 mV (RMS) ($P_O \approx 20$ mW).
2. The MUTE function of the TEA1085A has a logic input; the MUTE function of the TEA1085 has a toggle input.
3. SEL: loudspeaker connected in a single-ended-load configuration
   BTL: loudspeaker connected in a bridge-tied-load configuration
4. Consult the product specification for the package outline/s.

FUNCTIONAL DESCRIPTION

The TEA1083/83A is normally used in conjunction with a transmission circuit of the TEA1060 family. The circuit must be connected between the positive line terminal (pin 2) and pin SLPE of the transmission IC. The transmission characteristics (impedance, gain settings, etc.) are not affected.
An interconnection between the TEA1083/83A and a member of the TEA1060 family is illustrated in Fig.5.

Supplies SUP, SREF, V_{BB} and V_{SS}

In Fig.6 the line current is divided into I_{TR} for the transmission IC and I_{SUP} for the monitoring circuit TEA1083/83A.

I_{TR} is constant:

$I_{TR} = V_{int} / R20$

$I_{SUP} = I_{line} - I_{CC} - I_{TR}$

Where:

- V_{int} is an internal temperature compensated reference voltage of 500 mV (typ) between pins SUP and SREF
- R20 is a resistor connected between SUP and SREF
- I_{CC} is the internal current consumption of the TEA106X (approximately 1 mA).

A practical value for resistor R20 is 150 Ω; this produces a current of approximately 3.3 mA (typ) for I_{TR} and I_{SUP} is approximately equal to $I_{line} - 4.3$ mA.

The circuit stabilizes its own supply voltage at V_{BB}. Transistor TR1 provides the supplies for the internal circuits. Transistor TR2 is used to minimize signal distortion on the line by momentarily diverting the input current to V_{SS} whenever the instantaneous value of the voltage at V_{SUP} drops below the supply voltage V_{BB}. V_{BB} is fixed to a typical value of 2.95 V.
The supply at V_{BB} is decoupled with respect to V_{SS} by a 220 µF capacitor (C20).

The DC voltage ($V_{SUP} - V_{SS}$) is determined by the transmission IC and V_{int}; thus
$V_{SUP} - V_{SS} = V_{LN-SLPE} + V_{int}$.
The reference voltage of the transmission IC has to be adjusted to a level where $V_{SUP} - V_{BB\,(max)}$ is greater than 400 mV. The minimum voltage space between SUP and V_{BB} (400 mV) is required to maintain a 'high' efficiency of the internal supply for mean speech levels. $V_{BB\,(max)}$ is the specified maximum level.

The internal current consumption of the TEA1083/83A (I_{SUP0}) is typically 2.5 mA (where $V_{SUP} - V_{SS} = 3.6$ V). The current I_{SUP0} consists of currents I_{BIAS} (approximately 0.4 mA) for the circuitry connected to SUP and I_{BB0} (approximately 2.1 mA) for the internal circuitry connected to V_{BB} (see Fig.6).

LOUDSPEAKER AMPLIFIER (LSI1/LSI2 and QLS)

The TEA1083/83A has symmetrical inputs at LSI1 and LSI2. The input signal is normally taken from the earpiece output of the transmission circuit (see Fig.5) and/or from the signal output of the DTMF generator via a resistive attenuator.
The attenuation factor must be chosen in accordance with the output levels from the transmission IC and/or DTMF generator and, in accordance with the required output power and permitted signal distortion from the loudspeaker signal.

The output QLS drives the loudspeaker as a single-ended load. The output stage has been optimized for use with a 50 Ω loudspeaker (e.g. Philips type AD2071). The loudspeaker amplifier is enabled when the LSE input goes HIGH. The gain of the amplifier is fixed at 35 dB.

Volume control of the loudspeaker signal can be obtained by using a level control at the input (see Fig.5).

The maximum voltage swing at the QLS output is $V_{O(p\text{-}p)} = 2.5$ V (typical with 50 Ω load). The input level V_{LSI} is approximately 16 mV(rms) and the supply current $I_{SUP} > 11$ mA. In this condition the signal is limited by the available voltage space (V_{BB}). Higher input levels and/or lower supply currents will result in an increase of the harmonic distortion due to signal clipping.

With a limit of 2.5 V (p-p), the maximum output swing is dependent on the supply current and loudspeaker impedance. It can be approximated, for low distortions, by the following equation:

$$V_{O(p\text{-}p)} = 2 \times (I_{SUP} - I_{SUPO}) \times \pi \times R_{LS}$$

Where;

- $V_{O(p\text{-}p)}$ = the peak-to-peak level of the loudspeaker
- R_{LS} = the loudspeaker impedance
- I_{SUPO} = 2.5 mA (typ.)

POWER-DOWN INPUT (PD)

During pulse dialling or register recall (timed loop break) the telephone line is interrupted, thereby breaking the supply current to the transmission IC. The capacitor connected to V_{BB} provides the supply for the TEA1083/83A during the supply breaks.

By making the PD input HIGH during the loop break, the requirement on the capacitor is eased and, consequently, the internal current consumption I_{BB0} (see Fig.5) is reduced from 2.1 mA to 400 µA typically. Transistors TR1 and TR2 are inhibited during power-down and the bias current is reduced from approximately 400 µA to approximately 50 µA with $V_{SUP} = 3.6$ V in the following equation:

$$I_{SUP(PD)} = I_{BIAS(PD)} = (V_{SUP} - 2V_d)/Ra$$

Where $3.6 < V_{SUP} < V_{BB} + 3$ V

$2V_d$ is the voltage drop across 2 internal diodes (approximately 1.3 V)

Ra is an internal resistor (typical 50 kΩ)

LOUDSPEAKER ENABLE INPUT (LSE)

The LSE input has a pull-down structure. It switches the loudspeaker amplifier, in the monitoring condition, by applying a HIGH level at the input. The amplifier is in the standby condition when LSE is LOW (input open-circuit or connected to V_{SS}).

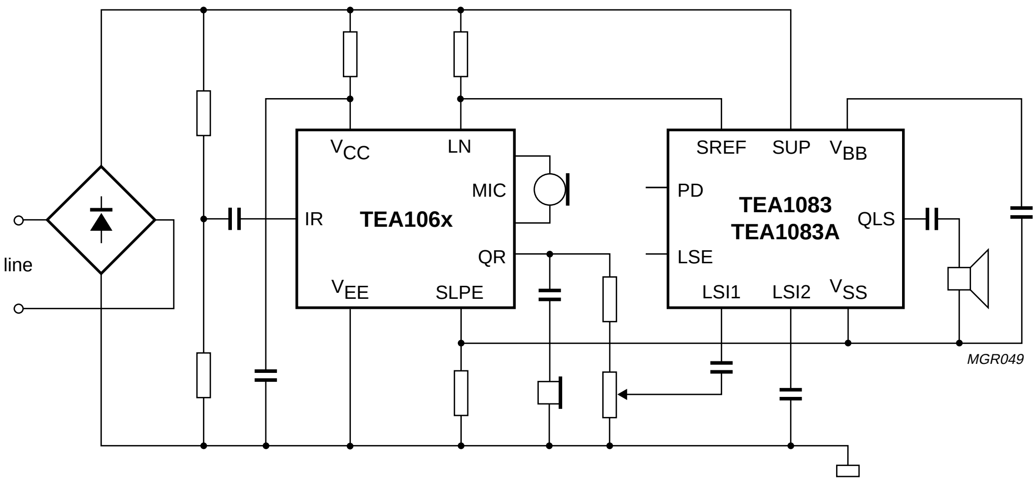


Fig.5 Interconnection with a transmission IC of the TEA106X family.

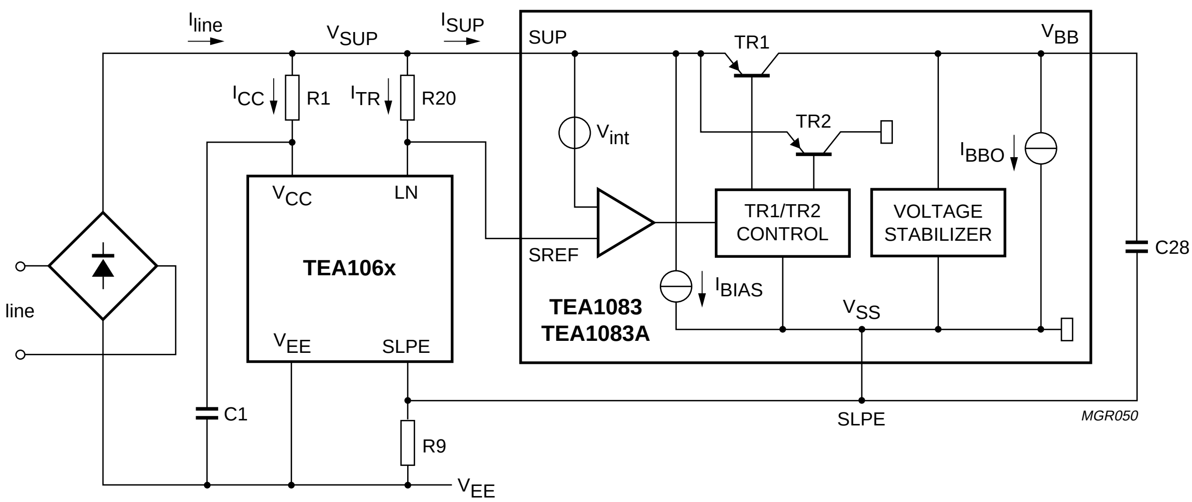


Fig.6 Supply arrangement.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC134)

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{SUP}	Supply voltage				
	continuous		–	12	V
	during switch-on or line interruption		–	13.2	V
V_{SUP}	Repetitive supply voltage from 1 ms to 5 s with 12 Ω current limiting resistor in series with supply		–	28	V
V_{SREF}	Supply reference voltage		V_{SS} – 0.5	V_{SUP} + 0.5	V
V	Voltage on all other pins		V_{SS} – 0.5	V_{BB} + 0.5	V
I_{SUP}	Supply current	see Fig.6	–	120	mA
P_{tot}	Total power dissipation	T_{amb} = 75 °C; T_j = 125 °C			
	TEA1083		–	500	mW
	TEA1083A		–	769	mW
	TEA1083AT		–	555	mW
T_{stg}	Storage temperature range		–40	+125	°C
T_{amb}	Operating ambient temperature range		–25	+75	°C
T_j	Junction temperature		–	+125	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j\text{-}a}$	from junction to ambient in free air (TEA1083)	100 K/W
	from junction to ambient in free air (TEA1083A)	65 K/W
	from junction to ambient in free air (TEA1083AT)	90 K/W

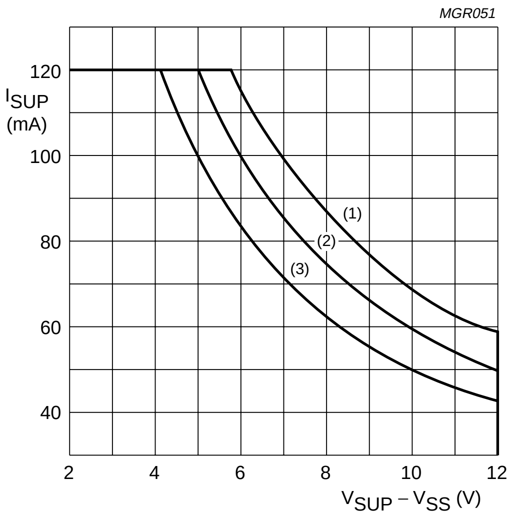


Fig.7 Safe operating area; see Table 2 (TEA1083).

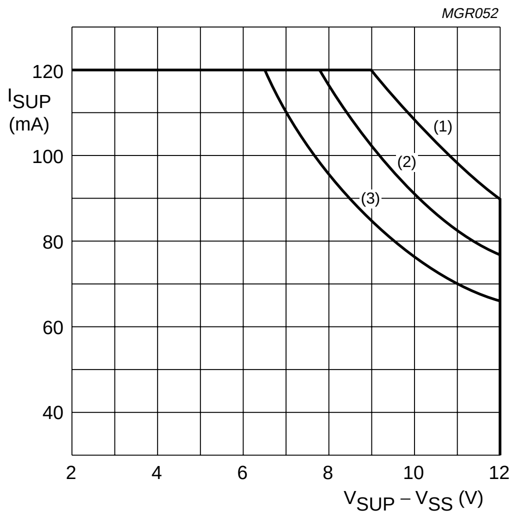


Fig.8 Safe operating areas see Table 3 (TEA1083A).

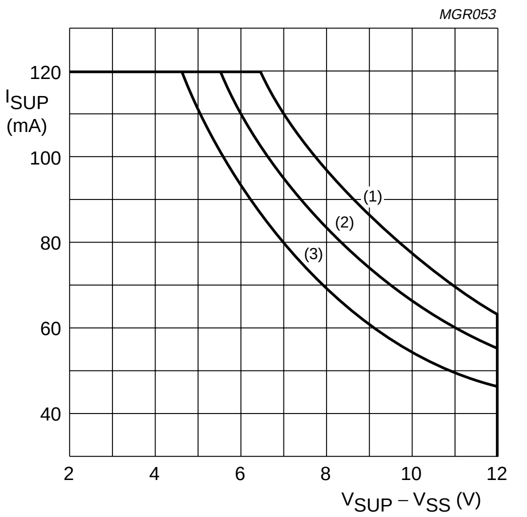


Fig.9 Safe operating area; see Table 4 (TEA1083AT).

Table 2

CURVE	T_{amb}	P_{tot}
1	55 °C	700 mW
2	65 °C	600 mW
3	75 °C	500 mW

Table 3

CURVE	T_{amb}	P_{tot}
1	55 °C	1077 mW
2	65 °C	923 mW
3	75 °C	769 mW

Table 4

CURVE	T_{amb}	P_{tot}
1	55 °C	777 mW
2	65 °C	666 mW
3	75 °C	555 mW

CHARACTERISTICS

V_{SUP} = 3.6 V; V_{SS} = 0 V; I_{SUP} = 15 mA; V_{SUP} = 0 V (RMS); f = 800 Hz; T_{amb} = 25 °C; PD = LOW; LSE = HIGH; loudspeaker amplifier load = 50 Ω; all measurements taken in test circuit Fig.10; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply						
V_{SUP}	Minimum DC input voltage		–	V_{BB} + 0.6	–	V
$V_{SUP-SREF}$	Internal reference voltage		400	500	600	mV
V_{BB}	Stabilized supply voltage	I_{SUP} = 15 mA	2.75	2.95	3.15	V
ΔV_{BB}	Variation of supply voltage	from I_{SUP} = 15 to 120 mA	–	15	–	mV
$\Delta V_{BB}/\Delta T$	Variation of supply voltage with temperature, referred to 25 °C	T_{amb} = –25 to +75 °C; I_{sup} = 15 mA	–	±0.2	–	mV/K
I_{SUP}	Minimum operating current		–	2.5	4.0	mA
THD	Distortion of AC signal between SUP and V_{EE}	$V_{SUP(RMS)}$ = 1 V	–	0.3	–	%
$V_{no(RMS)}$	Noise between SUP and V_{EE} (RMS value)	psophometrically weighted (P53 curve)	–	–71	–	dBmp
	Current consumption in power-down condition	PD = HIGH				
I_{SUP}	V_{SUP} = 3.6 V		–	50	75	µA
I_{BB}	V_{BB} = 2.95 V		–	400	550	µA
Loudspeaker amplifier inputs LSI1 and LSI2						
Z_i	input impedance (LSI1 and LSI2)	single ended	7.5	9.5	11.5	kΩ
		differential (LSI1 to LSI2)	15	19	23	kΩ
G_v	Voltage gain from LSI1/2 to QLS	I_{SUP} = 15 mA; V_i = 2 mV (RMS)	34	35	36	dB
ΔG_v	Total gain variation with input signal from 2 mV(RMS) to 10 mV(RMS)		–	0.2	–	dB
$\Delta G/\Delta T$	Total gain variation with temperature referred to 25 °C	T_{amb} = –25 to +75 °C	–	±0.4	–	dB
Output capabilities						
$V_{O(p-p)}$	Maximum output voltage (peak-to-peak value)	THD = 3%; 50 Ω load	2.0	2.5	–	V
$V_{O(p-p)}$	Output voltage (peak-to-peak value)	V_i = 10 mV(RMS); I_{SUP} = 15 mA; $V_{SUP}-V_{EE}$ = 1 V (RMS)	–	1.6	–	V
$V_{no(RMS)}$	Noise output voltage (RMS value)	1 kΩ between inputs LSI1 and LSI2; psophometrically weighted (P53 curve)	–	250	–	µV
Power-down input (PD) (TEA1083A only)						
V_{IL}	LOW level input voltage		0	–	0.3	V
V_{IH}	HIGH level input voltage		1.5	–	V_{BB}	V
I_{PD}	Input current	PD = HIGH	–	2.3	2.8	µA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
LSE input						
V_{IL}	LOW level input voltage		0	–	0.3	V
V_{IH}	HIGH level input voltage		1.5	–	V_{BB}	V
I_I	Input current	LSE = HIGH	–	5	10	µA
ΔG	Reduction of gain from LSI1/LSI2 to QLS	LSE = LOW	60	80	–	dB

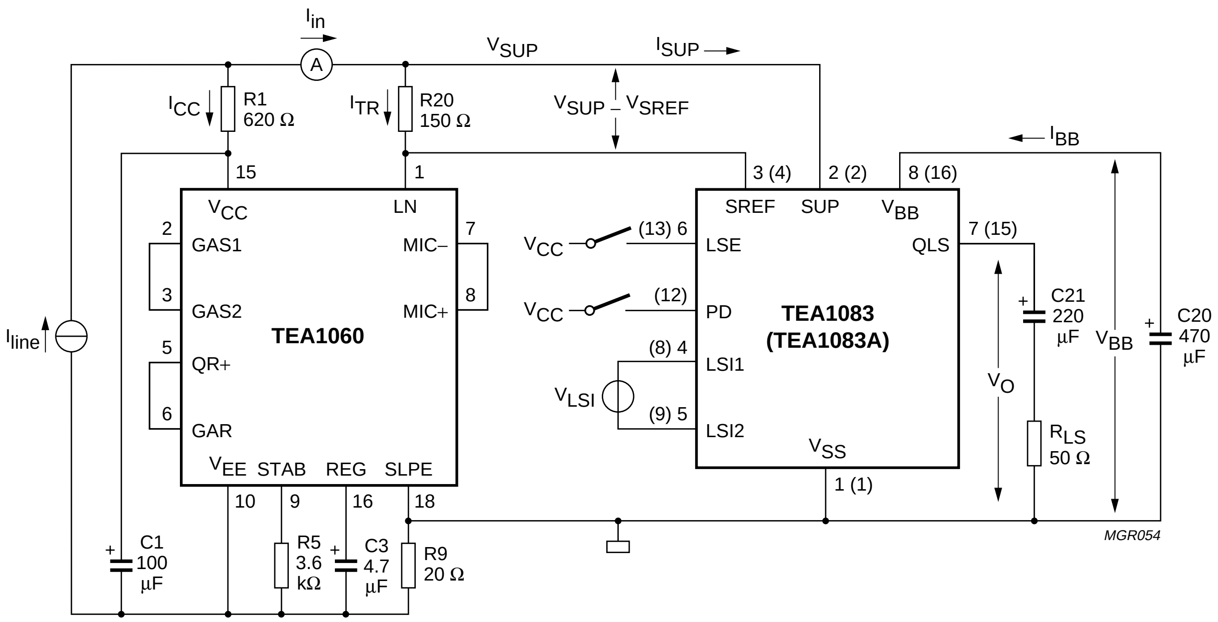


Fig.10 Test circuit.

Notes to figure 10

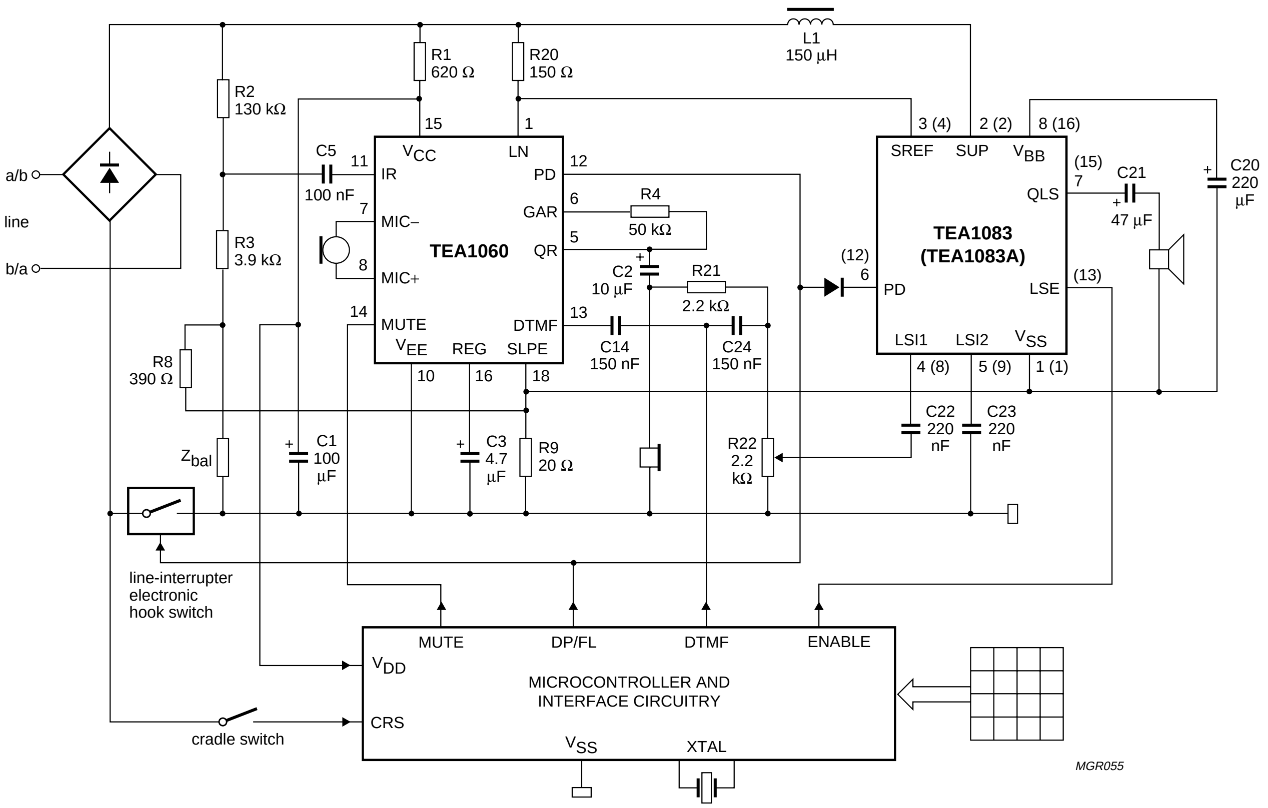
1. $I_{SUP} = I_{IN} - I_{TR}$
2. $G_v = 20\log\left|\frac{V_o}{V_{LSI}}\right|$
3. $I_{TR} = \frac{V_{SUP-SREF}}{R20}$
4. The pin numbers in parenthesis refer to the TEA1083A/AT
5. LSE has to be HIGH to measure the voltage gain
6. PD has to be HIGH to measure in PD conditions
7. The pins not shown in the TEA1060 are left open-circuit
8. An impedance in series with pin SUP (e.g. an ammeter) should be avoided as it interferes with the values of I_{TR} and I_{SUP}.

APPLICATION INFORMATION

An application of the TEA1083/83A, in conjunction with a member of the TEA1060 family, is illustrated in figure 11. The TEA1083/83A is used for call progress monitoring during on-hook dialling. The dialling facilities are performed by a microcontroller (e.g. PCD3344, PCD3349).

Only the most important components have been shown. For detailed information refer to a data sheet of the TEA1060 family.

The electronic hook switch can be replaced by a mechanical system (hook switch) with a hold/release function which is intended for on-hook dialling.

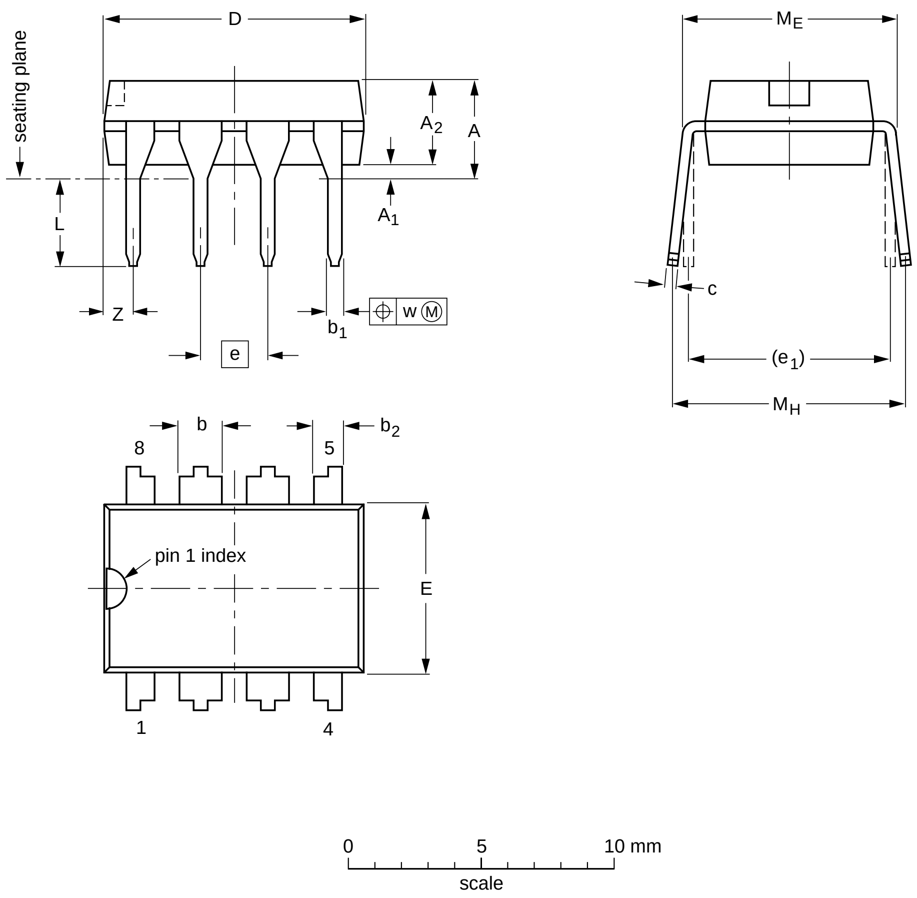


Pin numbers in parenthesis refer to the TEA1083A/AT.

Fig.11 Application example when the TEA1083/83A is used in conjunction with the TEA1060.

PACKAGE OUTLINES

DIP8: plastic dual in-line package; 8 leads (300 mil) **SOT97-1**



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

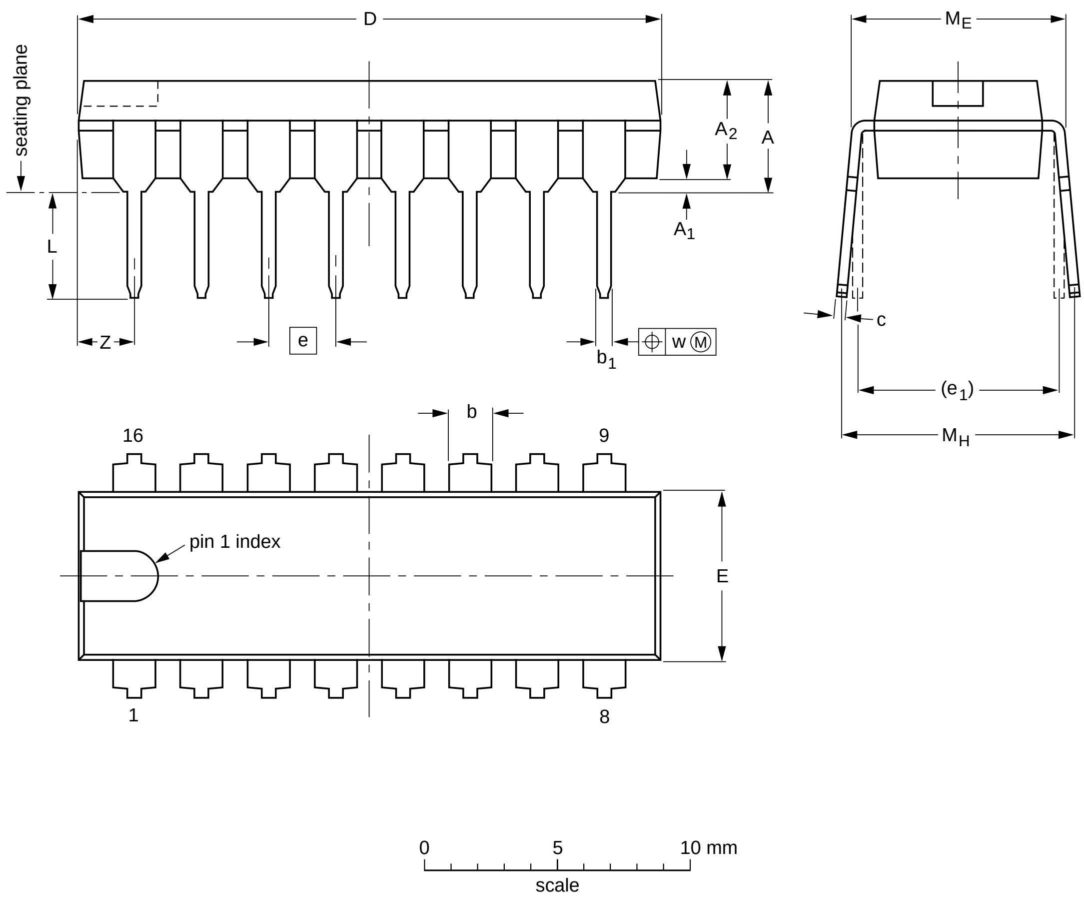
UNIT	A max.	A_1 min.	A_2 max.	b	b_1	b_2	c	D (1)	E (1)	e	e_1	L	M_E	M_H	w	Z (1) max.
mm	4.2	0.51	3.2	1.73 1.14	0.53 0.38	1.07 0.89	0.36 0.23	9.8 9.2	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	1.15
inches	0.17	0.020	0.13	0.068 0.045	0.021 0.015	0.042 0.035	0.014 0.009	0.39 0.36	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.045

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			
SOT97-1	050G01	MO-001AN				~~92-11-17~~ 95-02-04

DIP16: plastic dual in-line package; 16 leads (300 mil); long body **SOT38-1**



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

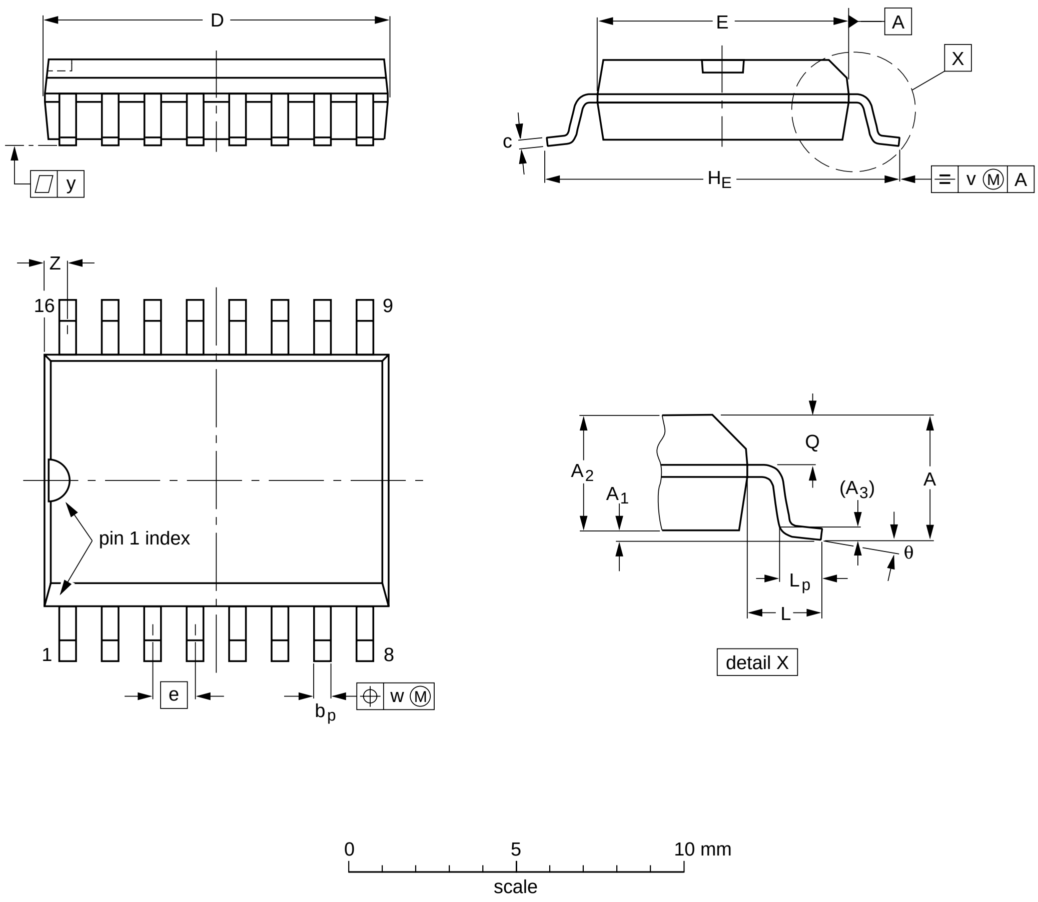
UNIT	A max.	A_1 min.	A_2 max.	b	b_1	c	D (1)	E (1)	e	e_1	L	M_E	M_H	w	Z (1) max.
mm	4.7	0.51	3.7	1.40 1.14	0.53 0.38	0.32 0.23	21.8 21.4	6.48 6.20	2.54	7.62	3.9 3.4	8.25 7.80	9.5 8.3	0.254	2.2
inches	0.19	0.020	0.15	0.055 0.045	0.021 0.015	0.013 0.009	0.86 0.84	0.26 0.24	0.10	0.30	0.15 0.13	0.32 0.31	0.37 0.33	0.01	0.087

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			
SOT38-1	050G09	MO-001AE				~~92-10-02~~ 95-01-19

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 *"Data Handbook IC26; Integrated Circuit Packages"* (order code 9398 652 90011).

DIP

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.

SO

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

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