INTEGRATED POWER AUDIO AMPLIFIER

The TCA160 is a monolithic integrated audio amplifier incorporating high flexibility for applications in battery and mains-fed equipment.
Due to special internal circuitry (stabilization, temperature correction, 20 dB feedback) the features are:
- negligible cross-over distortion over the entire supply voltage range (5 to 16 V).
- low quiescent current with low spread (5 to 15 mA) adjusted with a fixed resistor, so presetting is avoided.

Additional features are:
- high peak current (1 A).
- high unloaded supply voltage is tolerated (18 V).
- high gain (closed loop 50 dB at a feedback of 20 dB).
- safe operation regarding second breakdown.

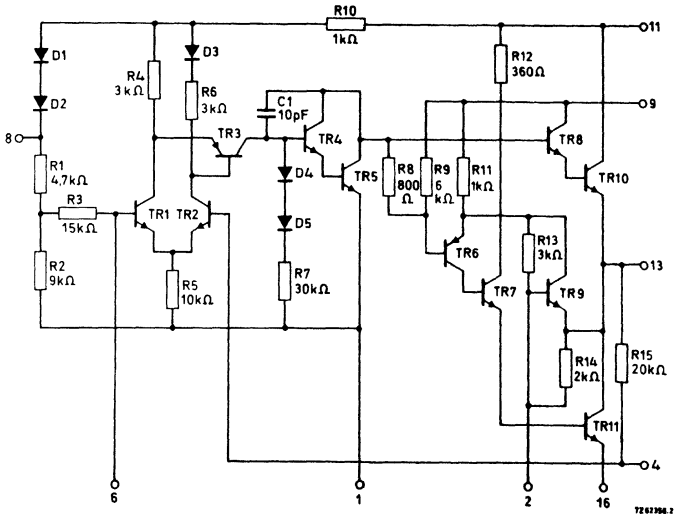
The special low thermal resistance envelope enables (at T_{amb} = 25 °C) a power dissipation of 0,9 W for TCA160 and 1,2 W for TCA160B without using an external heatsink.

QUICK REFERENCE DATA						
Supply voltage range			V_P		5 to 16	V
Total quiescent current			I_{tot}		5 to 15	mA
Unloaded supply voltage (peak value)			V_{PM}	max.	18	V
Output power			onset of clipping		d_{tot} = 10 %	
at V_P = 9 V; R_L = 8 Ω	P_o	typ.	0,9		1,0	W
Total distortion before clipping			d_{tot}	typ.	0,7	%
Input impedance			$\|Z_i\|$	typ.	15	kΩ
Sensitivity for d_{tot} = 10 %			V_i	typ.	10	mV

PACKAGE OUTLINE

TCA160 : 16 lead plastic power dual in-line (See page 9)
TCA160B : 16 lead plastic power dual in-line with cemented aluminium heat spreader (See page 10)

CIRCUIT DIAGRAM



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

Voltages

Supply voltage (pin No. 11)	V_{11-16}	max.	16	V
Unloaded supply voltage (pin No. 11; peak value) (no signal condition)	V_{11-16M}	max.	18	V

Currents

Output current (pin No. 13, 11, 4)	I_O	max.	1	A
Non-repetitive peak output current (pin No. 13, 11, 4)	I_{OSM}	max.	2	A

Power dissipation [1])

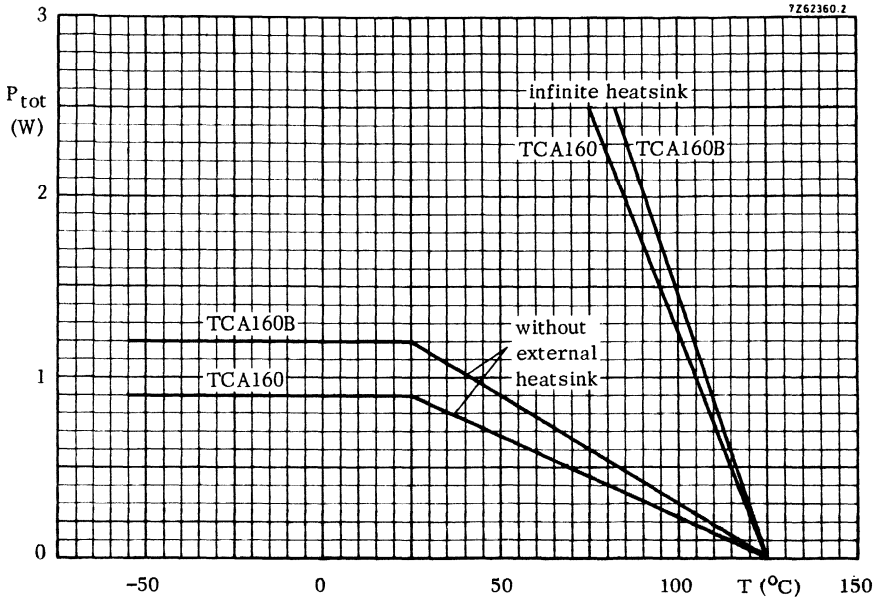
Dissipation without external heatsink at T_{amb} = 25 °C	TCA160 :	P_{tot}	max.	0,9	W
	TCA160B :	P_{tot}	max.	1,2	W

Temperatures

Storage temperature	T_{stg}	−55 to +125	°C
Operating ambient temperature	T_{amb}	−25 to +125	°C

1) See derating curve on page 3.

RATINGS (continued)



Design data

Pin No. 6 to No. 4 voltage	$\pm V_{6-4}$	max.	6	V
Pin No. 13 to No. 16 voltage	V_{13-16}	max.	16	V
Pin No. 11 to No. 13 voltage	V_{11-13}	max.	16	V

CHARACTERISTICS at T_{amb} = 25 °C; V_P = 9 V; R_L = 8 Ω unless otherwise specified

D.C. characteristics

Supply voltage range	V_{11-16}		5 to 16	V
Total quiescent current	I_{11tot}	typ.	8,7 5 to 15	mA mA 1)
Saturation voltages of output stages at I_o = 0.5 A	V_{CEsat}	<	0,9	V

A.C. characteristics

A.F. output power at onset of clipping	P_o	typ.	0,9	W
at d_{tot} = 10 %	P_o	typ.	1,0	W
Open loop voltage gain	G_v	typ.	70	dB
Total distortion before clipping	d_{tot}	typ.	0,7	%
Noise output power at R_S = 0	P_N	typ.	1,0	nW 1)2)
Signal to noise ratio at P_o = 1 W; R_S = 2 kΩ	S/N	typ.	80	dB 2)
Input sensitivity for d_{tot} = 10 %	V_i	typ.	10	mV
Input impedance	Z_i	typ.	15	kΩ

1) Measured with a.c. short circuited input.
2) Measured at a frequency ranging from 60 Hz to 15 kHz.

NOTES from page 5

1) Measured before output capacitor (C5),
2) Measured across R_L.
3) At R1 = 47 Ω. The gain can be increased by decreasing the value of R1; at decreasing the gain level however the maximum tolerated value of R1 amounts to 100 Ω; at further decrease of the gain an attenuator at the input is preferred.
4) To limit the frequency a capacitor must be connected across the input. For example: at R_S = 2 kΩ and C_x = 3,9 nF the upper frequency is 20 kHz (−3 dB). C_x also avoids oscillations at open input.
5) The lower limit can be decreased by a proportional increase of C3. e.g. at 60 Hz: C3 = 47 μF. Supply by-passing capacitor C2 also must be adapted to the lower frequency; at f_{min} = 60 Hz: C2 = 680 μF.
6) R_S = 0 Ω
7) R_S = 2 kΩ

APPLICATION INFORMATION (all values are typical)

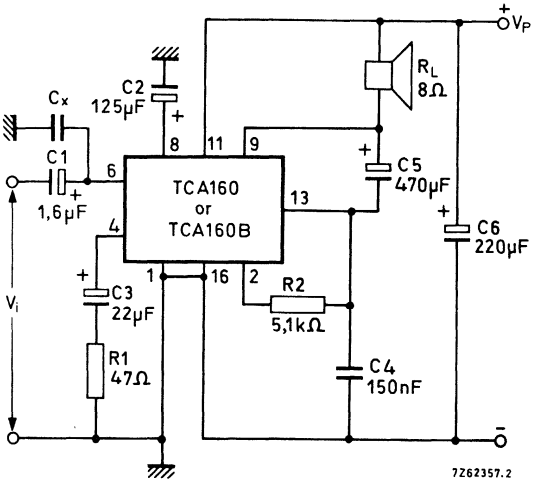
Supply voltage V_{11-16}	7,5	9	9	12	V	
Load resistance	4	4	8	8	Ω	
A.F. output power	0,9	1,2	1,0	1,5	W	1)
at onset of clipping	0,8	1,1	0,9	1,4	W	2)
A.F. output power	1,2	1,6	1,3	2,2	W	1)
at d_{tot} = 10 %	1,1	1,5	1,2	2,0	W	2)
Sensitivity						
for P_o = 50 mW V_i	1,4	1,4	2	1,8	mV	
for d_{tot} = 10 % V_i	7,3	8,0	10	13,0	mV	
Supply current for full output power	225	300	190	250	mA	
Quiescent current I_{tot}	8,1	8,7	8,7	8,6	mA	
Max. power dissipation	710	1020	510	910	mW	
Value of R1	47	47	47	47	Ω	
R2	5,1	5,1	5,1	5,1	Ω	
C1	1,6	1,6	1,6	1,6	μF	
C2	125	125	125	125	μF	
C3	22	22	22	22	μF	
C4	330	330	150	150	nF	
C5	1000	1000	470	470	μF	
C6	220	220	220	220	μF	
Input impedance Z_i	15	15	15	15	kΩ	
Closed loop voltage gain G_v	50	50	50	50	dB	3)
Open loop voltage gain G_v	70	70	70	70	dB	
Frequency responce	← 145 Hz to 110 kHz →					4)5)
Noise output power P_N	2,5	2,5	1,0	1,0	nW	6)
Noise output power P_N	19	19	9,5	10,2	nW	7)

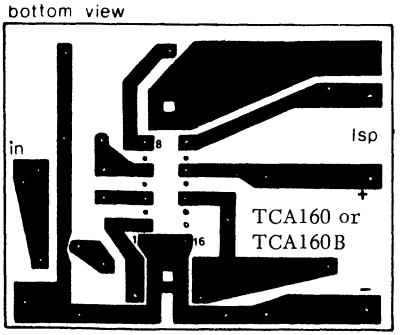
For notes see page 4

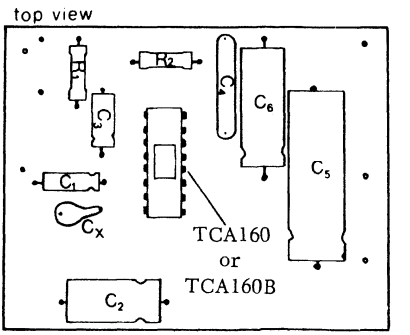
APPLICATION INFORMATION (continued)

General notes

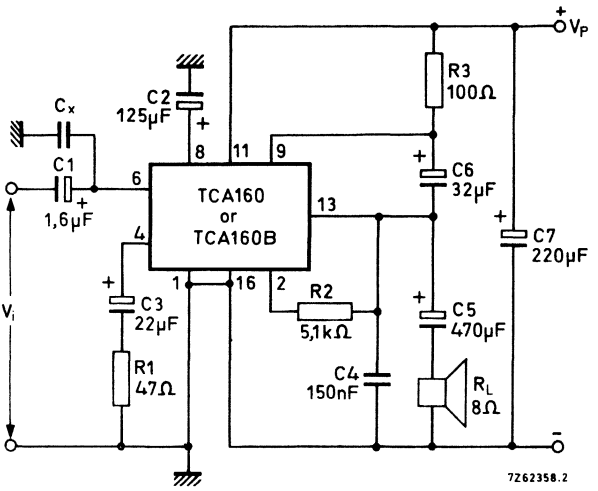
1. At using a mains-fed power supply with high ripple it is advantageous to connect the speaker to ground by bootstrapping pin 9 (see figure on page 7).
2. Prescription for print lay-out:
   Pin No. 1 must be used as a ground connection for the input circuit.
   Pin No. 16 must be used for the output circuit and for connection of the supply voltage.
   The pins No. 16 and 1 have to be interconnected as close to the package as possible to prevent a common impedance in the ground line.
3. The smoothing capacitor across the supply must be connected close to the pins.

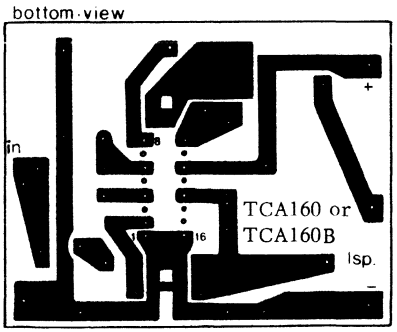


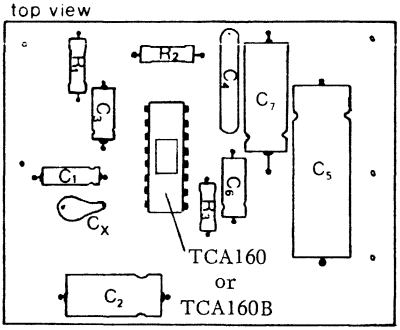


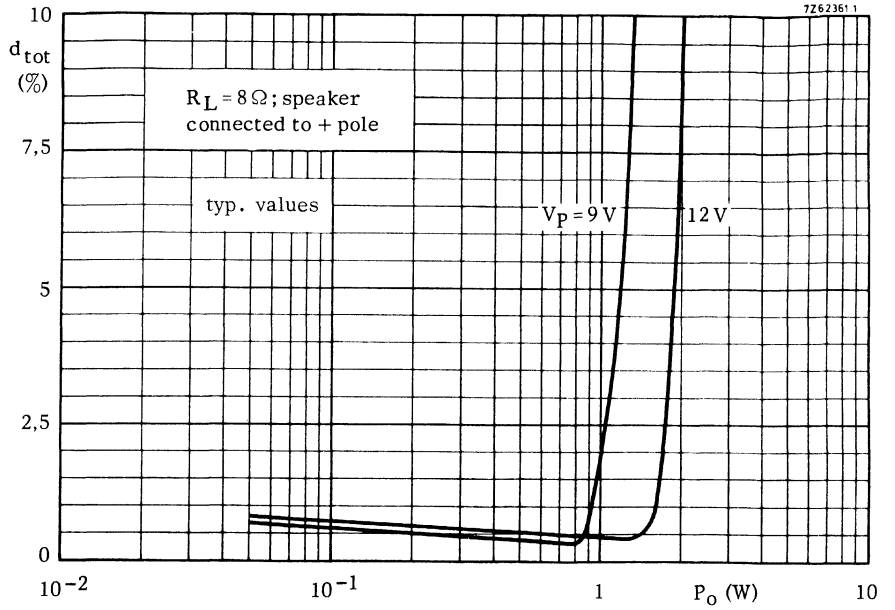


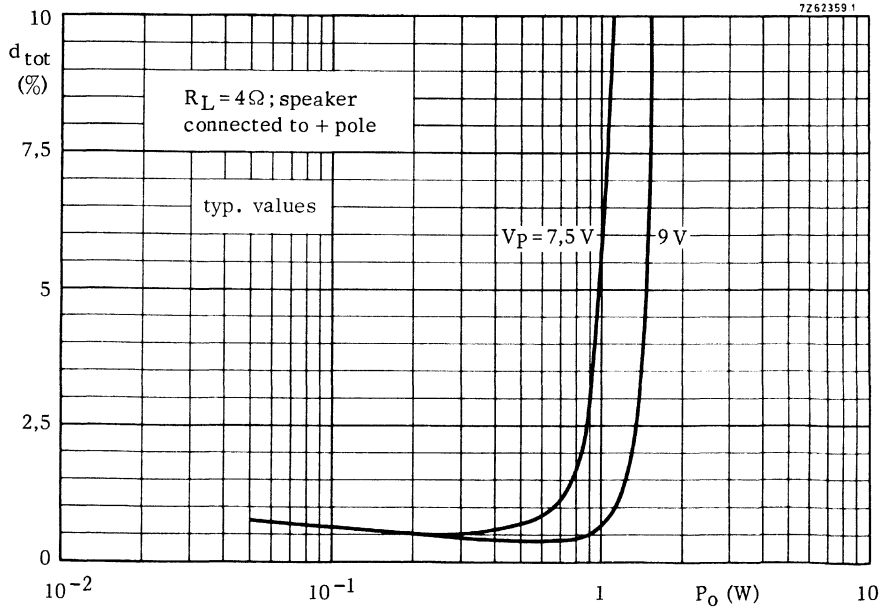
APPLICATION INFORMATION (continued)





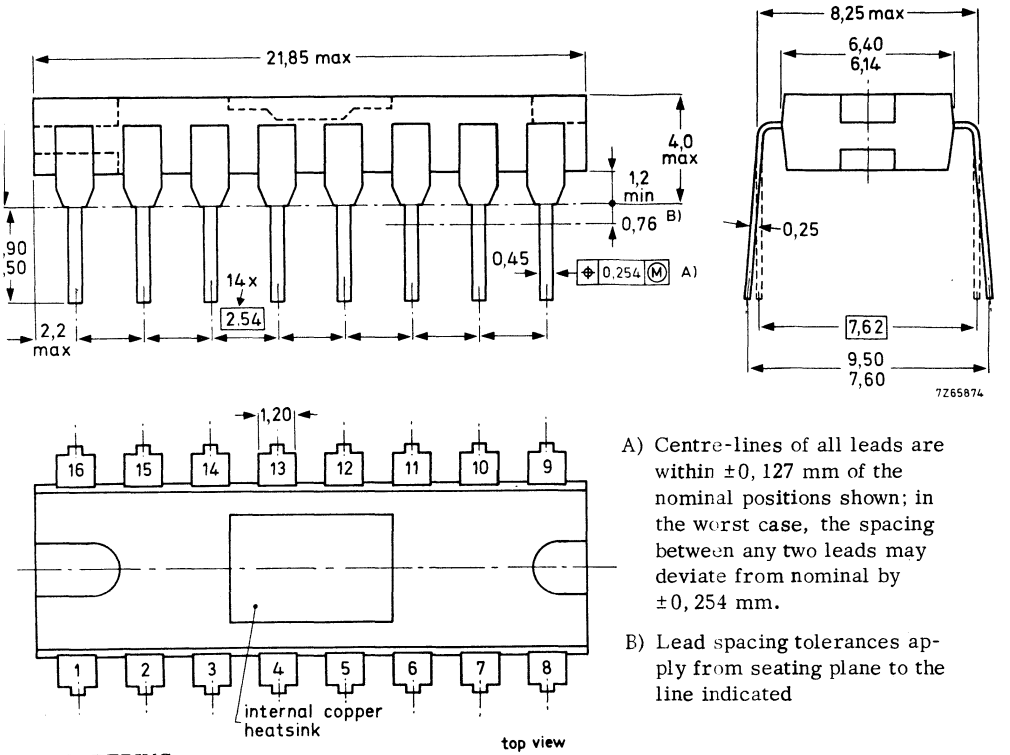



7Z62361.1
10
d_{tot} (%)
7,5
5
2,5
0
$R_L = 8\Omega$; speaker connected to + pole
typ. values
$V_P = 9$ V
12 V
10^{-2}
10^{-1}
1
P_o (W)
10


7Z62359.1
10
d_{tot} (%)
7,5
5
2,5
0
$R_L = 4\Omega$; speaker connected to + pole
typ. values
$V_P = 7{,}5$ V
9 V
10^{-2}
10^{-1}
1
P_o (W)
10

16 LEAD PLASTIC POWER DUAL IN-LINE

Dimensions in mm



A) Centre-lines of all leads are within ±0, 127 mm of the nominal positions shown; in the worst case, the spacing between any two leads may deviate from nominal by ±0, 254 mm.

B) Lead spacing tolerances apply from seating plane to the line indicated

SOLDERING

1. By hand

   Apply the soldering iron below the seating plane (or not more than 2 mm above it). If its temperature is below 300 °C it must not be in contact for more than 10 seconds; if between 300 °C and 400 °C, for not more than 5 seconds.

2. By dip or wave

   260 °C is the maximum allowable temperature of the solder; it 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 storage maximum. If the printed circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the allowable limit.

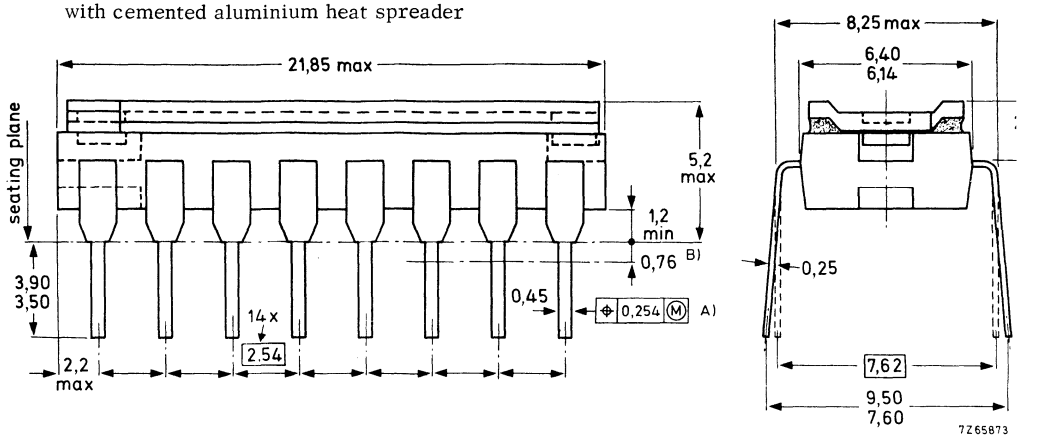
3. Repairing soldered joints

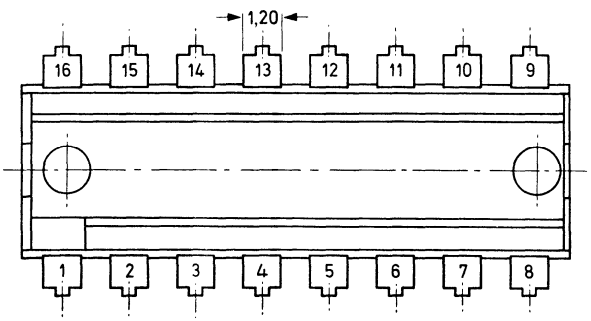
   The same precautions and limits apply as in (1) above.

16 LEAD PLASTIC POWER DUAL IN-LINE

with cemented aluminium heat spreader

Dimensions in mm





top view

A) Centre-lines of all leads are within ±0,127 mm of the nominal positions shown; in the worst case, the spacing between any two leads may deviate from nominal by ±0,254 mm.

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