LINEAR INTEGRATED CIRCUIT

SGS **TDA2310**

Hi-Fi DUAL PREAMPLIFIER

The TDA2310 is a dual high quality **class A** preamplifier intended for extremely low distortion application in Hi-Fi systems.
The TDA2310 is a monolithic integrated circuit in a 14-lead dual-in-line plastic package and its main features are:

- Very high dynamic range
- Very low distortion
- High open loop bandwidth
- Very low noise
- No pop-noise
- High slew-rate: 14V/µs (G_v = 30 dB) - 50V/µs (G_v = 50 dB)
- Large output voltage swing
- Single or split supply operation
- Output short circuit protection

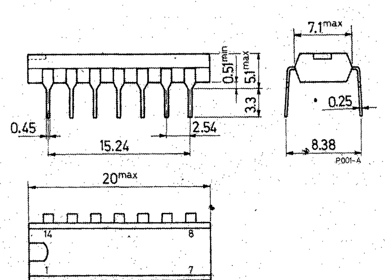
ABSOLUTE MAXIMUM RATINGS

V_s	DC supply voltage	± 22	V
V_s	Operating supply voltage	± 20	V
V_{cm}	Common mode input voltage	± 15	V
V_i	Differential input voltage	± 5	V
P_{tot}	Total power dissipation at $T_{amb} < 60°C$	500	mW
T_j, T_{stg}	Junction and storage temperature	-40 to 150	°C

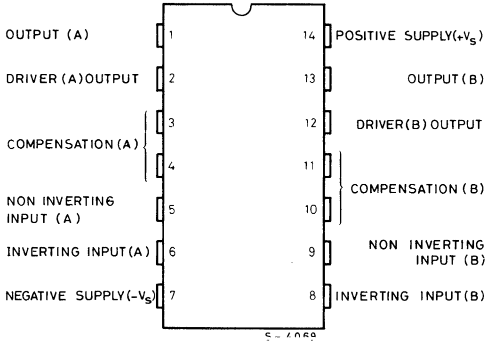
ORDERING NUMBER: TDA2310

MECHANICAL DATA

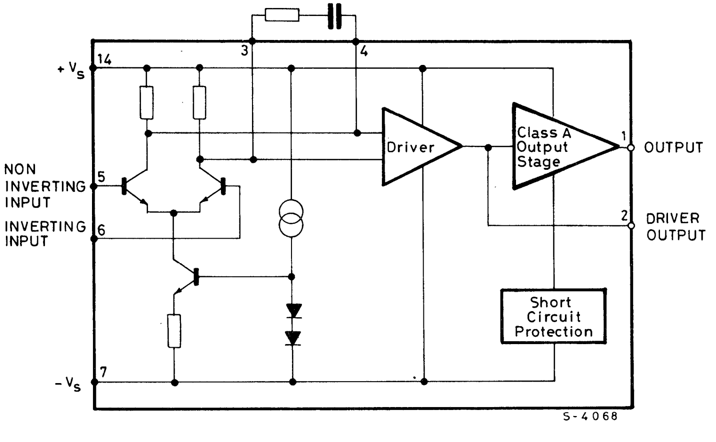
Dimensions in mm



CONNECTION DIAGRAM
(top view)



BLOCK DIAGRAM
(one section)



THERMAL DATA

$R_{thj\text{-}amb}$	Thermal resistance junction-ambient	max.	180	°C/W

Fig. 1 - Gain and distortion test

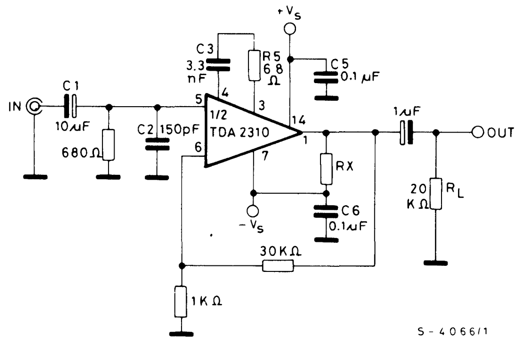
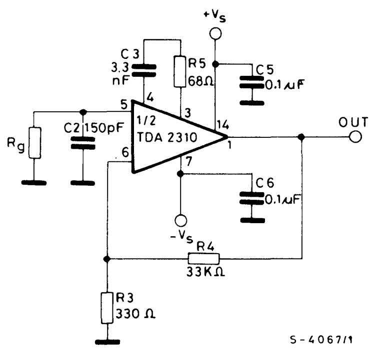


Fig. 2 - Noise test



ELECTRICAL CHARACTERISTICS (Refer to the Test circuit of fig. 1, T_{amb} = 25°C, V_s = ± 15V, G_v = 30dB, R_L = 20KΩ unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
V_s	Supply voltage		± 5		± 20	V
I_s	Supply current			10	15	mA
I_b	Input bias current			0.2	1	µA
I_{os}	Input offset current			50	300	nA
V_{os}	Input offset voltage			1	3	mV

ELECTRICAL CHARACTERISTICS (continued)

Parameter		Test conditions		Min.	Typ.	Max.	Unit
G_v	Voltage gain (open loop)	f = 1KHz	No compensation		85		dB
		f = 20KHz	No compensation		85		dB
ΔG_v	Voltage gain spread (closed loop)	f = 1KHz			±0.2		dB
		f = 100KHz			±0.5		dB
R_i	Input resistance	f = 1KHz			5		MΩ
R_o	Output resistance	f = 1KHz			10		Ω
V_{pp}	Output voltage swing (peak to peak)	d = 1%	f = 1KHz		24		V
		d = 1%	f = 100KHz		22		V
V_o	Output voltage (rms)	R_x = 8.2KΩ	f = 1KHz	6	8		V
		R_x = 8.2KΩ	f = 20KHz	6	8		V
BW	Power bandwidth	V_o = 20 Vpp , R_x = 8.2 KΩ			160		KHz
SR	Slew rate	G_v = 30dB			14		V/μs
		G_v = 50dB (C_3 = 330pF, R_5 = 470Ω)			50		V/μs
d	Total harmonic distortion	V_o = 3V	f = 1KHz		0.035		%
		V_o = 3V	f = 20 KHz		0.035		%
d_2	Second order CCIF intermodulation distortion	V_{o1} = 1V, V_{o2} = 1V	f2 - f1 = 1 KHz		0.01	0.1	%
d_3	Third order CCIF intermodulation distortion	f1 = 14KHz, f2 = 15KHz	$2f_1 - f_2$ = 13 KHz		0.03	0.1	%
e_N	* Total input noise	R_g = 600Ω R_g = 3.3KΩ (°)			0.6 1.0	0.8	μV
		R_g = 600Ω R_g = 3.3KΩ (°°)			0.75 1.2		μV
S/N	* Signal to noise ratio	V_o = 500mV	R_g = 3.3K R_g = 600 (°) R_g = 0		74 78 80		dB
		V_o = 500mV	R_g = 3.3K R_g = 600 (°°) R_g = 0		72 76 78		dB
C_s	Channel separation	f = 20KHz R_g = 600Ω			100		dB
CMR	Common mode rejection	R_g = 600Ω			95		dB
SVR	Supply voltage rejection	R_g = 600Ω			85		dB
I_{sh}	Output short circuit current				15		mA

(*) Test circuit of fig. 2 (G_v = 40 dB)
(°) BW = curve A (°°) BW = 22Hz to 22KHz

Fig. 3 - Harmonic distortion vs. output level.

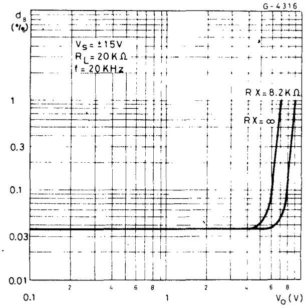


Fig. 4 - Harmonic distortion vs. frequency.

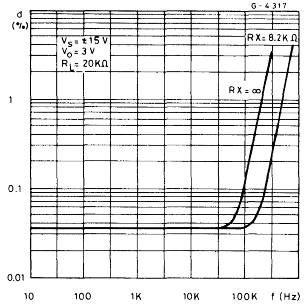


Fig. 5 - Output voltage swing vs. frequency.

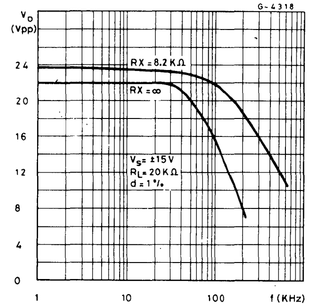


Fig. 6 - Output voltage swing vs. load resistance.

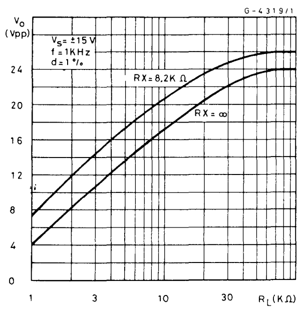


Fig. 7 - Total input noise vs. source resistance.

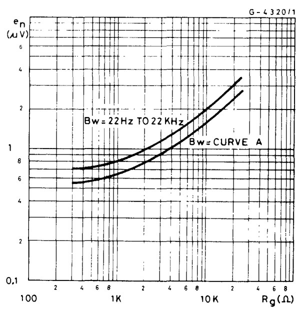


Fig. 8 - Noise density vs. frequency.

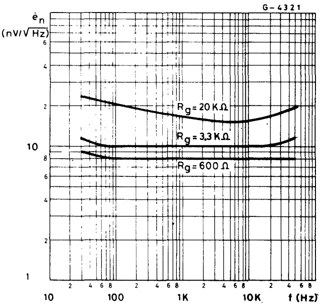


Fig. 9 - Open loop frequency response.

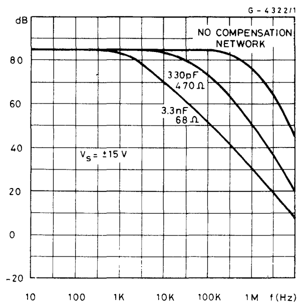


Fig. 10 - Closed loop gain vs. frequency.

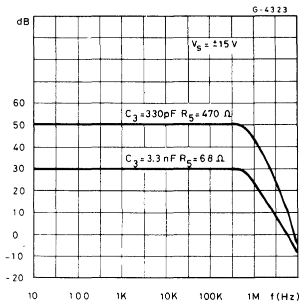
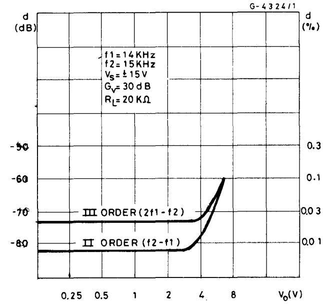


Fig. 11 - Two tone CCIF intermod. distortion.



APPLICATION INFORMATION

Fig. 12 - Very low dynamic distortion stereo RIAA preamplifier.
$V_s = \pm 15V$
RIAA frequency response (20Hz to 20KHz) = ± 0.5 dB
Harmonic distortion = 0.02% (f = 20KHz)

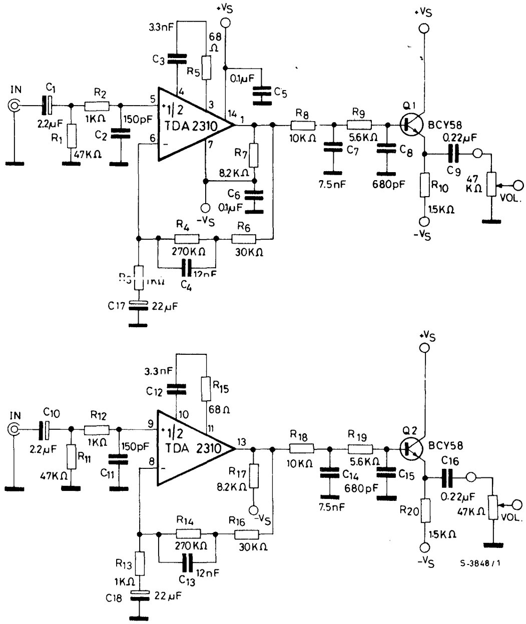


Fig. 13 - RIAA preamplifier response.

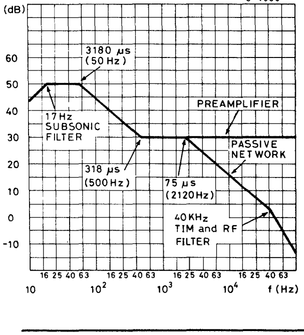


Fig. 14 - Two tone intermodulation distortion vs. input level.

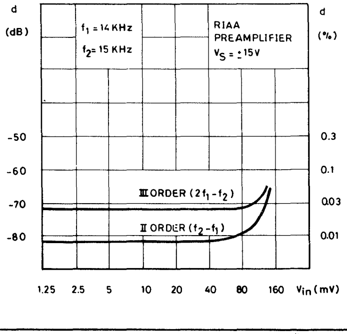
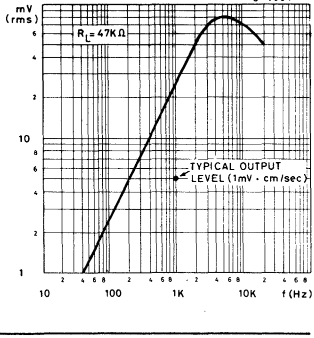
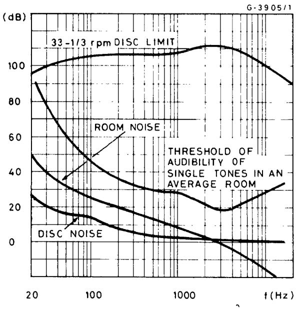


Fig. 15 - Maximum output level of high quality magnetic cartridge vs. frequency.



APPLICATION INFORMATION (continued)

Fig. 16 - Dynamic range of disc music.

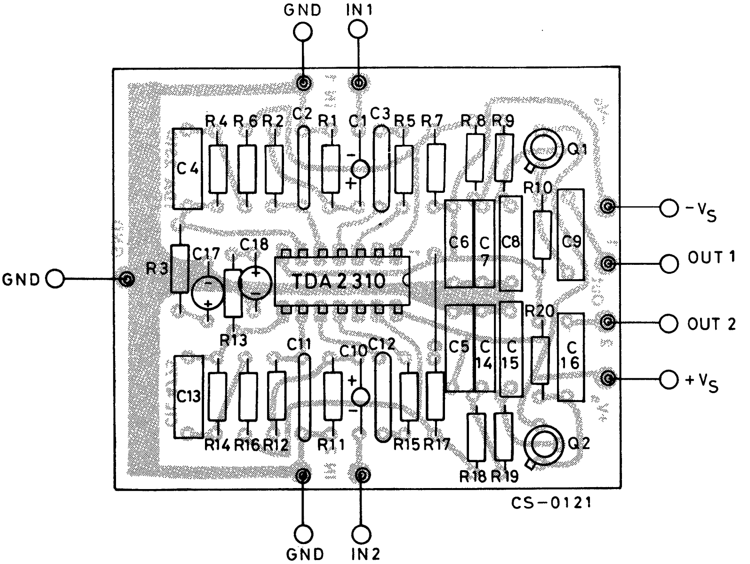


As shown in fig. 15 the maximum expected output level of an high quality magnetic cartridge playing modern discs is lower than 80mV rms.

The dynamic range needed is about 70dB (fig. 16).

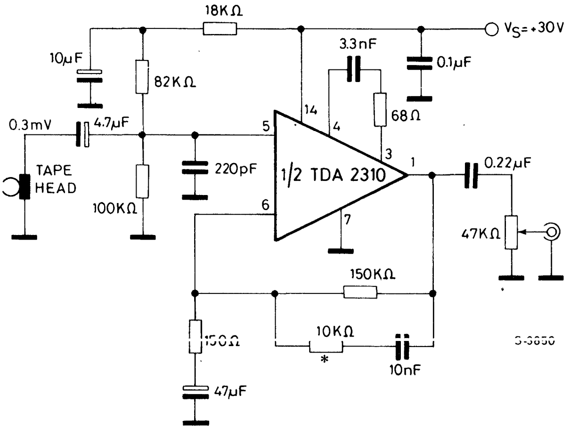
The TDA2310 is perfectly suited to RIAA preamplifier applications due to the ~100 dB dynamic range (150mV input 0.1% distortion to 1 μV noise).

Fig. 17 - PC board and components layout of RIAA preamplifier (1:1 scale)



APPLICATION INFORMATION (continued)

Fig. 18 - Hi-Fi tape preamplifier (EQ. = 70μs).



* 18KΩ for EQ = 120μs.

Fig. 19 - Frequency response of graphic equalizer of fig. 20

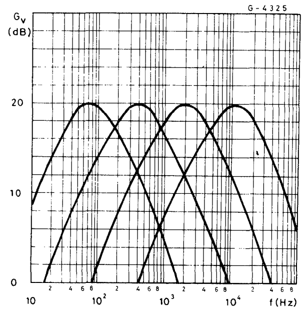
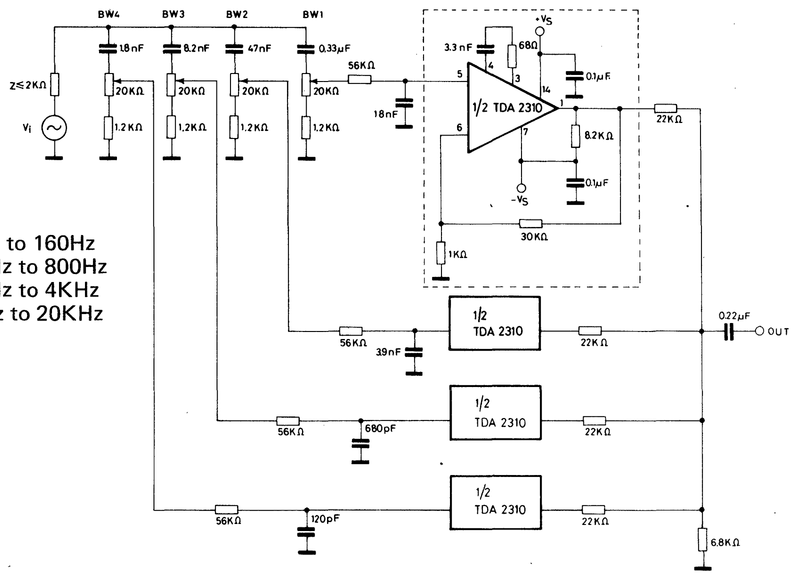


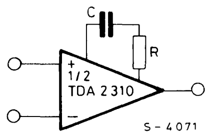
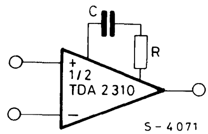
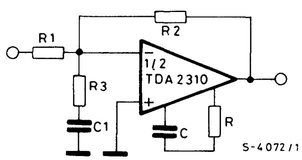
Fig. 20 - Four band graphic equalizer

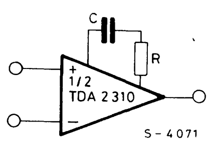
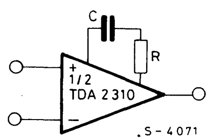


BW1 = 30Hz to 160Hz
BW2 = 160Hz to 800Hz
BW3 = 800Hz to 4KHz
BW4 = 4KHz to 20KHz

APPLICATION INFORMATION (continued)

The table shows the suggested compensation networks depending on the slew-rate and gain required in the application.

<table>
<tr><th>Slew-Rate (V/µs)</th><th>G_V min. (dB)</th><th colspan="2">Compensation Network</th><th>Note</th></tr>
<tr><td>50</td><td>50</td><td>
</td><td>R = 470Ω
C = 330pF</td><td>High gain Applications</td></tr>
<tr><td>14</td><td>30</td><td>
</td><td>R = 68Ω
C = 3.3nF</td><td>RIAA Preamplifier</td></tr>
<tr><td rowspan="2">14</td><td>10</td><td rowspan="2">

R = 68Ω C = 3.3nF</td><td>R_1 = 56KΩ
R_2 = 180KΩ
R_3 = 680Ω
C_1 = 10nF</td><td rowspan="2">Inverting Configuration</td></tr>
<tr><td>0</td><td>R_1=R_2=56KΩ
R_3 = 680Ω
C_1 = 10nF</td></tr>
<tr><td>5</td><td>20</td><td>
</td><td>R = 33 Ω
C = 10nF</td><td rowspan="2">Low Slew-Rate Applications</td></tr>
<tr><td>2</td><td>6</td><td>
</td><td>R = 10 Ω
C = 47 nF</td></tr>
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