

D.C. TREBLE AND BASS STEREO CONTROL CIRCUIT

The TCA740A is a monolithic integrated circuit for controlling treble and bass in stereo amplifiers by means of a d.c. voltage.

Features:

- two double potentiometer circuits
- feedback control
- internal amplifier
- high-ohmic signal inputs
- converter for the control voltages
- low-ohmic and short-circuit protected signal outputs

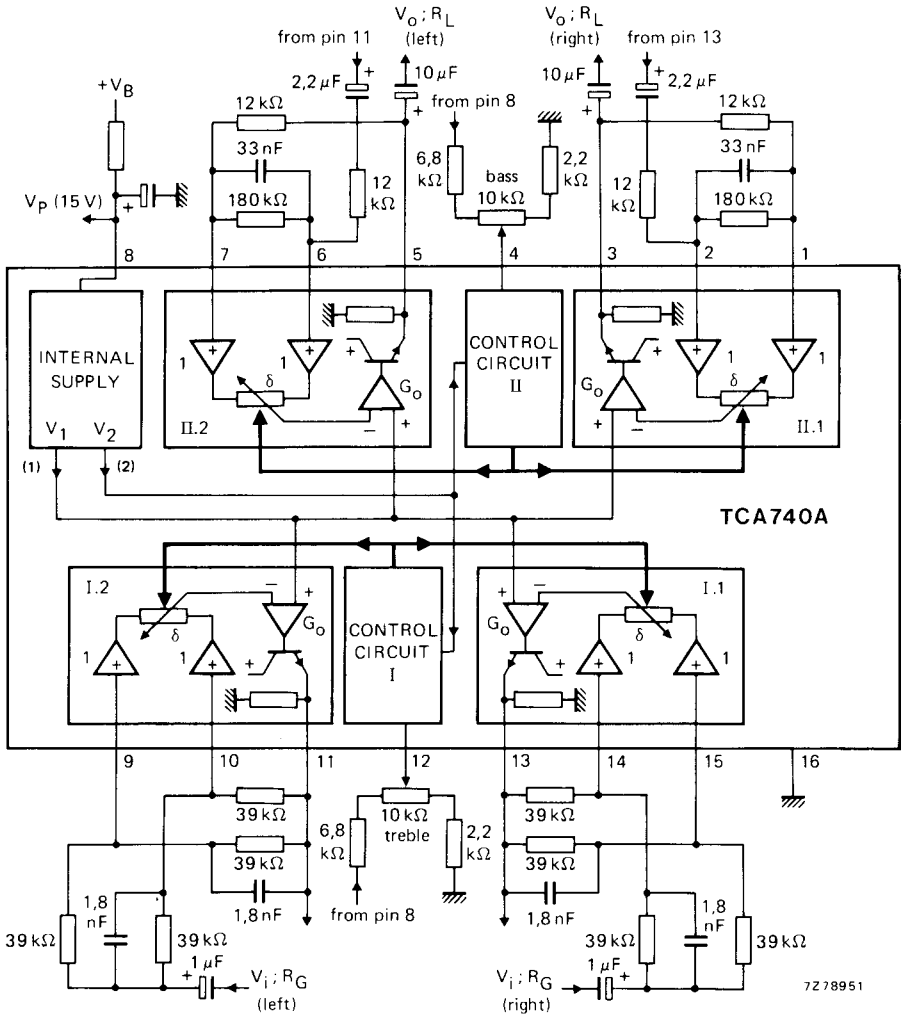
QUICK REFERENCE DATA

Supply voltage (pin 8)	V_p	typ.	15 V
Supply current (pin 8)	I_p	typ.	35 mA
Bass boost and cut at 40 Hz (ref. 1 kHz)		typ.	± 16 dB
Treble boost and cut at 16 kHz (ref. 1 kHz)		typ.	± 16 dB
Input/output voltage at $d_{tot} = 0,7\%$ (r.m.s. value)	$V_{i, o (rms)}$	typ.	2 V
Total distortion at $V_{O(rms)} = 1$ V; linear frequency response	d_{tot}	typ.	0,1 %
Channel separation	α	typ.	70 dB
Output signal plus noise voltage (r.m.s. value)	$V_{no (rms)}$	typ.	45 μ V
Frequency response (-1 dB)	f		20 Hz to 20 kHz
Treble/bass control voltage range	$V_{12-16}; V_{4-16}$		1,8 to 9,5 V

Supply voltage range (pin 8)	V_p		13,5 to 16,5 V
Ambient temperature range	T_{amb}		-30 to $+80$ °C

PACKAGE OUTLINE

16-lead DIL; plastic (SOT-38).



- (1) $6,6 V_{BE}$; $V_1 = 4,6 V$
- (2) $0,31 V_p + 1,4 V_{BE}$; $V_2 = 5,6 V$

Fig. 1 Block diagram with external circuitry.

RATINGS

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

Supply voltage (pin 8)	V_p	max.	18 V
Control voltages (pins 4 and 12)	V_{4-16}	max.	12 V
	$-V_{4-16}$	max.	5 V
	V_{12-16}	max.	12 V
	$-V_{12-16}$	max.	5 V
Total power dissipation	P_{tot}	max.	900 mW
Storage temperature range	T_{stg}		-55 to + 150 °C
Operating ambient temperature range	T_{amb}		-30 to + 80 °C

CHARACTERISTICS

$V_p = 15$ V; $T_{amb} = 25$ °C; measured in Fig. 1; in position 'linear' ($V_{4-16} = V_{12-16} = 5,6$ V);
 $R_G = 60$ Ω ; $R_L = 5,6$ k Ω ; $f = 1$ kHz; unless otherwise specified

Supply voltage range (pin 8)	V_p		13,5 to 16,5 V
Supply current (pin 8)	I_p	typ.	34 mA 25 to 45 mA

Signal processing

Voltage gain at linear frequency response	G_V	typ.	0 dB
Frequency response (-1 dB)	f		20 Hz to 20 kHz
Maximum gain variation at $f = 1$ kHz at maximum bass/treble boost or cut	ΔG_V	<	$\pm 1,5$ dB
Bass boost at 40 Hz (ref. 1 kHz) $V_{4-16} = 9,2$ V		>	15 dB
		typ.	16 dB
Bass cut at 40 Hz (ref. 1 kHz) $V_{4-16} = 2$ V		>	15 dB
		typ.	16 dB
Treble boost at 16 kHz (ref. 1 kHz) $V_{12-16} = 9,2$ V		>	15 dB
		typ.	16 dB
Treble cut at 16 kHz (ref. 1 kHz) $V_{12-16} = 2$ V		>	15 dB
		typ.	16 dB
Total distortion	$V_{o(rms)} = 100$ mV; $f = 1$ kHz	d_{tot}	typ. 0,03 %
	$V_{o(rms)} = 100$ mV; $f = 40$ Hz to 16 kHz	d_{tot}	typ. 0,1 %
	$V_{o(rms)} = 1$ V; $f = 1$ kHz	d_{tot}	typ. 0,07 %
	$V_{o(rms)} = 1$ V; $f = 40$ Hz to 16 kHz	d_{tot}	< 0,2 %
		d_{tot}	typ. 0,2 %
Input/output voltage at $d_{tot} = 0,7$ % (r.m.s. value)	$V_{i(rms)} = V_{o(rms)}$	>	1,6 V
		typ.	2 V
Output signal plus noise voltage (r.m.s. value) $f = 20$ Hz to 20 kHz	$V_{no(rms)}$	typ.	40 μ V
	$V_{no(m)}$	typ.	90 μ V
<		160 μ V	

CHARACTERISTICS (continued)

Channel separation

f = 1 kHz	α	typ.	72 dB
f = 250 Hz to 12,5 kHz	α	typ.	68 dB
f = 40 Hz to 16 kHz	α	>	50 dB
		typ.	58 dB

Control voltages

Recommended control voltage range
treble/bass

$V_{4-16} = V_{12-16}$	>	0 V
		2 to 9,2 V
	<	0,66 V_P V
		typ. 5,6 V

Control voltage at linear frequency response

$V_{4-16} = V_{12-16}$		5,4 to 5,8 V
		(0,31 V_P to 1,4 V_{BE}) V

Quiescent input current

$V_{4-16} = V_{12-16} = 2$ to 9,2 V	I_{4-12}	typ.	6 μA
		<	25 μA

Input resistance (pins 4 and 12)

$V_{4-16} = V_{12-16} = 5,6$ V	$R_{i4;12}$	typ.	800 k Ω
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Amplifier characteristics

Quiescent input currents; $V_i = 4,6$ V
(pins 1, 2, 6, 7, 9, 10, 14 and 15)

$I_{1;2;6;7;9;10;14;15}$	typ.	0,6 μA
	<	2 μA

Input resistance (pins 1,2,6,7,9,10,14 and 15)

$R_{i1;2;6;7;9;10;14;15}$	>	1 M Ω
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Internal emitter resistance at outputs

$R_{3-16}; R_{5-16}; R_{11-16}; R_{13-16}$	typ.	2 k Ω
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Output resistance (pins 3,5,11 and 13)

$R_{o3;5;11;13-16}$	typ.	10 Ω
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Maximum gain; no load

G_V	>	40 dB
	typ.	43 dB

D.C. output voltages

$V_{4-16} = V_{12-16} = 5,6$ V (pins 3,5,11 and 13)	$V_{3-16}; V_{5-16}; V_{11-16}; V_{13-16}$	typ.	4,6 V
			4,3 to 4,9 V
			(6,6 V_{BE}) V

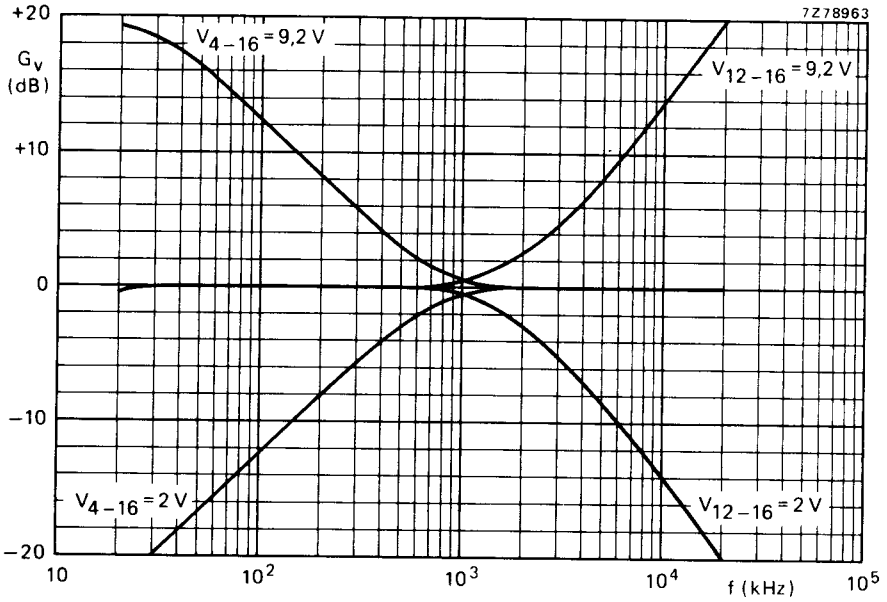


Fig. 2 Frequency response.

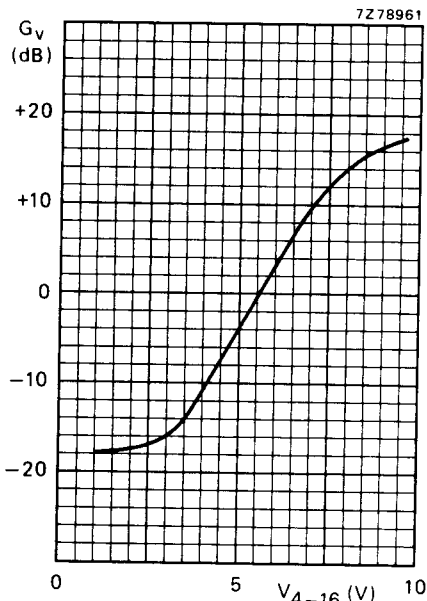


Fig. 3 Bass control curve at $f = 40\text{ Hz}$.

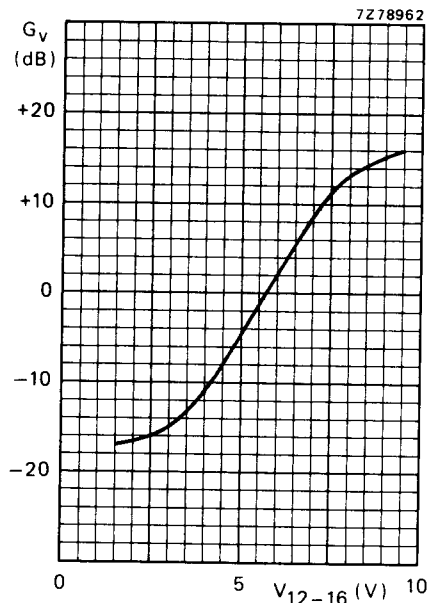


Fig. 4 Treble control curve at $f = 16\text{ kHz}$.

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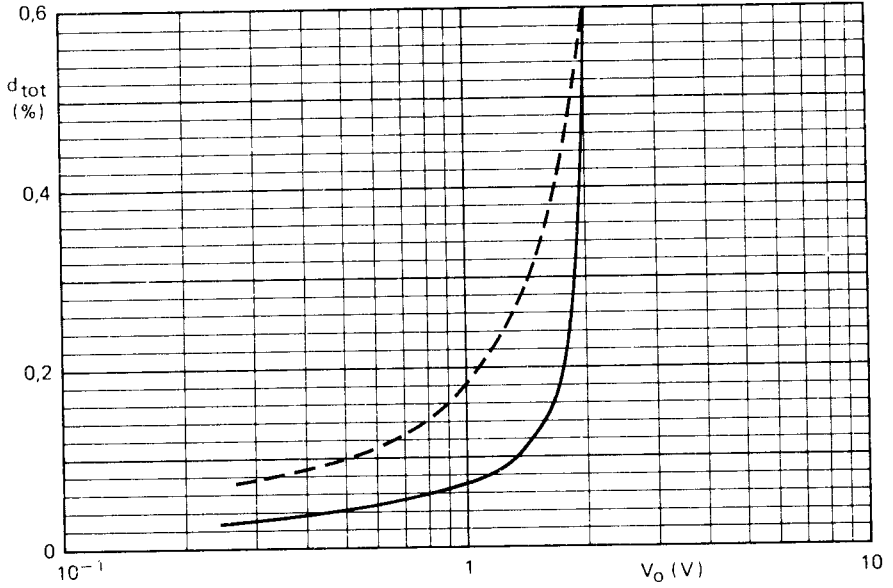


Fig. 5 Total distortion as a function of output voltage; $V_{4-16} = V_{12-16} = 5,6$ V (linear, $G_{V\ tot} = 1$);
— $f = 1$ kHz; - - - $f = 40$ Hz to 16 kHz.

APPLICATION INFORMATION

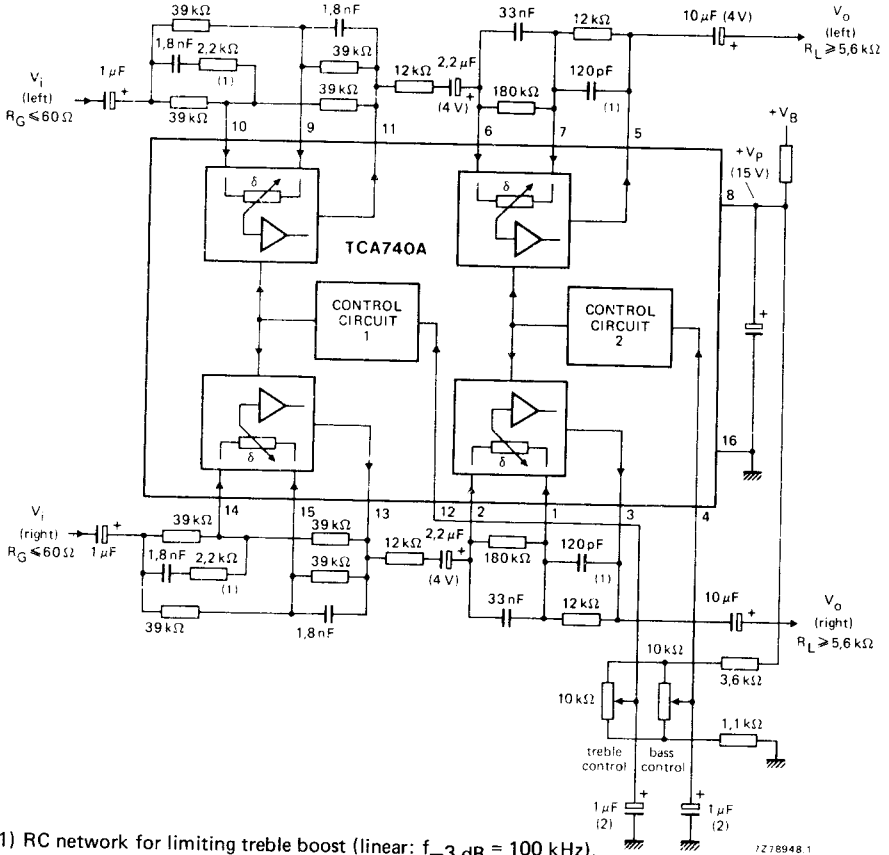
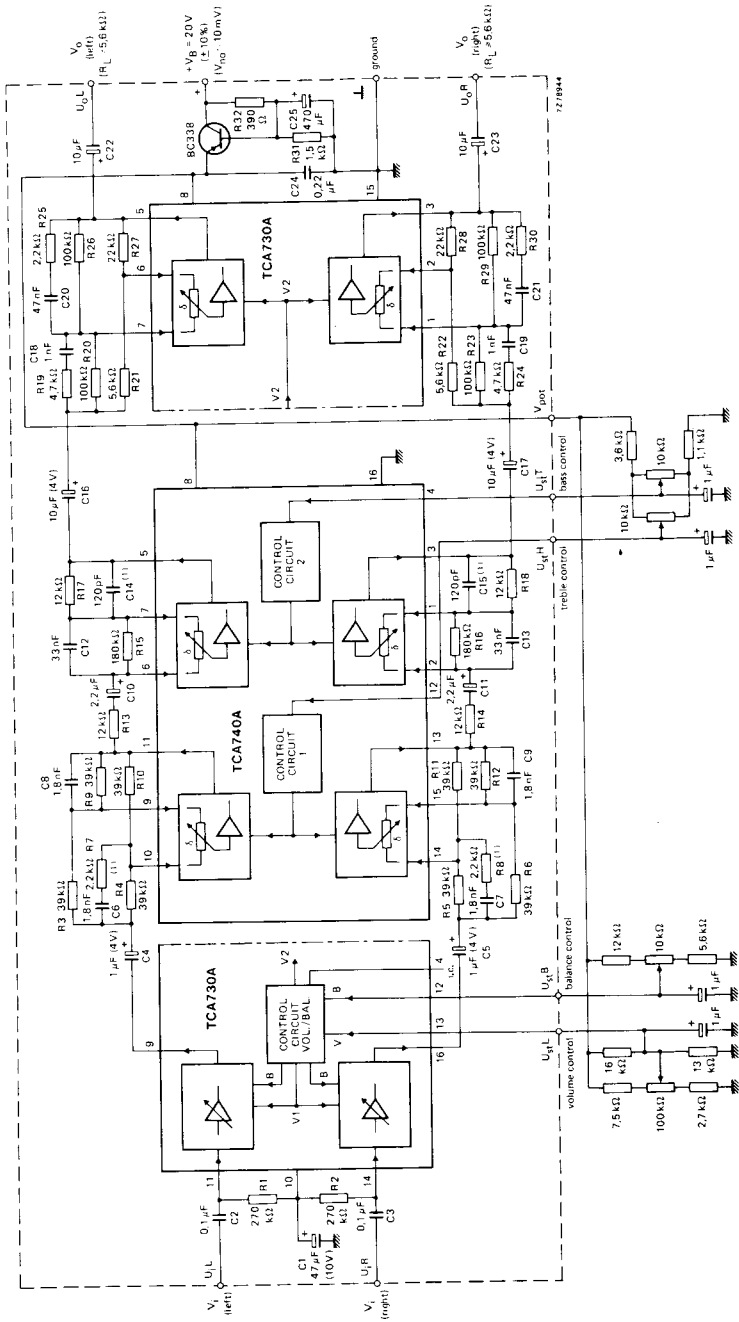


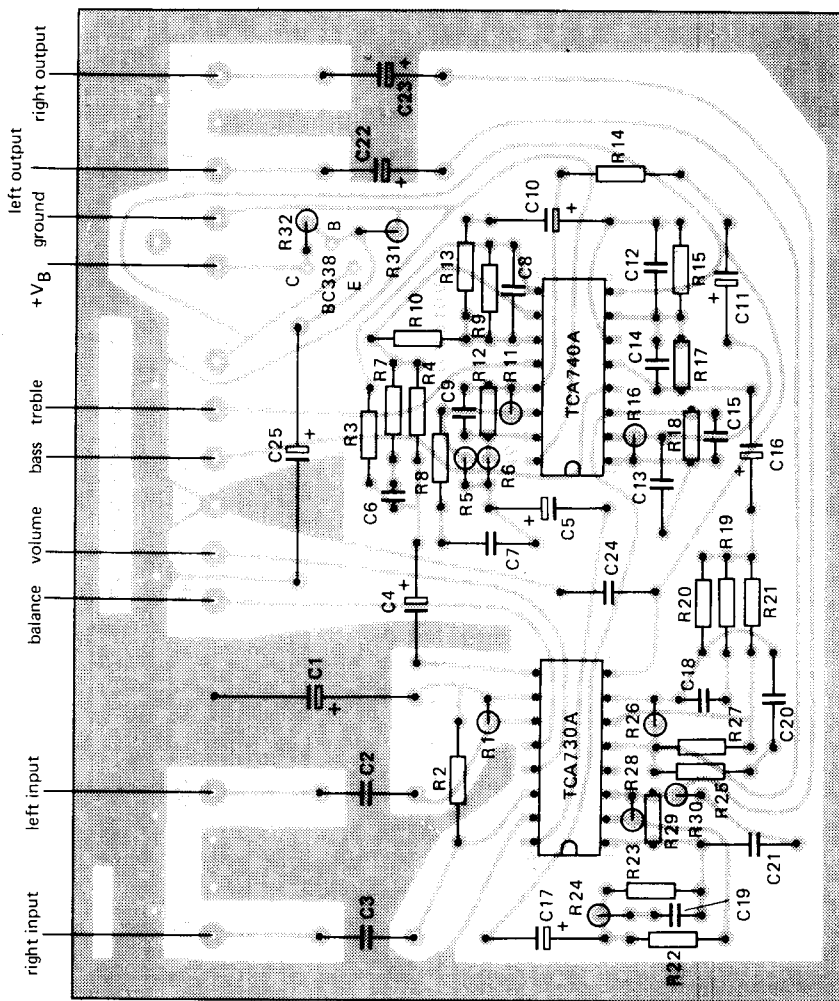
Fig. 6 Application example of TCA740A used for treble and bass control.

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(1) RC network for limiting treble boost (linear: $f_{-3\text{dB}} = 100\text{ kHz}$).

Fig. 7 Application diagram for TCA730A and TCA740A. For printed-circuit board see Fig. 8.



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Fig. 8 Printed-circuit board component side, showing component layout; for circuit diagram see Fig. 7.

