NEUMANN Operationsverstärker OA 10
NEUMANN Operational Amplifier OA 10

The most important features of an operational amplifier provided for application in the professional audio technique are extremely low self noise at low source impedances, high modulating capability of the loaded output, high gain reserve, full power output at high frequencies, low power supply sensitivity, and some others. Since these requirements can not or only partly be fulfilled by the available operational amplifiers of the integrated type especially for audio applications, the OA 10 was designed. Some typical features are indicated below:

- Lowest input noise voltage — 0.5 µV typical
- High output current — 150 mA
- Frequency compensation internal or external
- Large power bandwidth — 70 kHz typical
- Output short-circuit protection
- Low power supply sensitivity
- Large power supply voltage range — ± 2.5...± 22 V

To minimize the external circuit as far as possible the always necessary capacitive bridging of the supply voltage is already installed. When operating the OA 10 with only one supply voltage ½ V^+ can be taken from an internal voltage divider (see fig. 7,8). Through connecting pin 3 with 6 the OA 10 can be switched off. In this case the inputs and the output become currentless.

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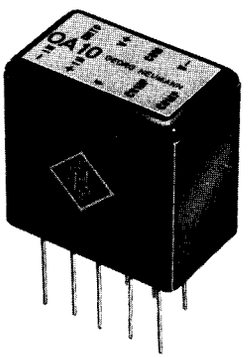
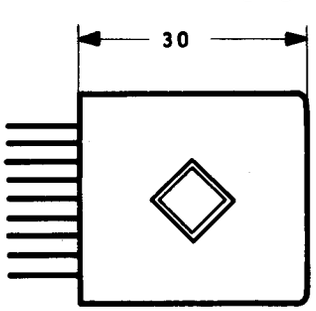
OPERATIONAL AMPLIFIER
FOR SPECIAL AUDIO APPLICATIONS
DISCRETE COMPONENTS

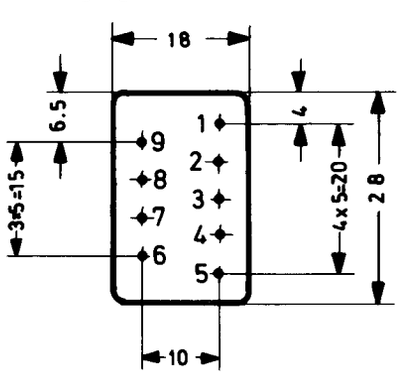


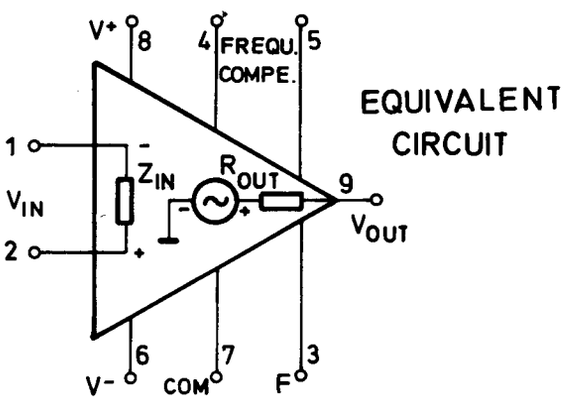
Die wichtigsten Merkmale eines Operationsverstärkers, der universelle Anwendung in der professionellen Tontechnik finden soll, sind extrem geringes Eigenrauschen bei niedrigen Quellwiderständen, hohe Durchsteuerfähigkeit des belasteten Ausgangs, hohe Verstärkungsreserve, volle Leistungsabgabe bei hohen Frequenzen, geringe Speisespannungsempfindlichkeit und einige mehr. Da diese Forderungen von den im Handel befindlichen integrierten Operationsverstärkern nicht oder nur teilweise erfüllt werden, wurde speziell für diese Anwendungsfälle der OA 10 entwickelt. Einige typische Eigenschaften sind folgende:

- Geringes Eigenrauschen — 0,5 µV typisch
- Hoher Ausgangsstrom — 150 mA
- Frequenzkompensation intern oder extern
- Große Leistungsbandbreite — 70 kHz typisch
- Kurzschlußsicher-Ausgang
- Hohe Speisespannungsdämpfung
- Hoher Betriebsspannungsbereich — ±2,5...± 22 V

Um den äußeren Beschaltungsaufwand möglichst klein zu machen, wurde bereits die stets erforderliche kapazitive Überbrückung der Speisespannung eingebaut. Bei Betrieb mit nur einer Betriebsspannung kann ½ V^+ einem eingebauten Spannungsteiler entnommen werden (siehe Fig. 7,8). Außerdem gibt es die Möglichkeit, den OA 10 durch Verbinden von Stift 3 und 6 abzuschalten. Hierbei werden die Eingänge und der Ausgang stromlos.







November 1972

Printed in Germany

MAXIMUM RATINGS (T_A = +25°C UNLESS OTHERWISE NOTED)

RATING	VALUE	UNIT
POWER SUPPLY VOLTAGE	±22	VDC
DIFFERENTIAL INPUT SIGNAL	±7	VOLTS
COMMON-MODE INPUT SWING	$+V^+$ $-V^-$	VOLTS
LOAD CURRENT	150	mA
MAXIMUM OUTPUT POWER (SINE WAVE)	1.5	W
OPERATING TEMPERATURE RANGE	0 TO 75	°C

ELECTRICAL CHARACTERISTICS (V^+ = +15V, V^- = -15V, T_A = +25°C)

CHARACTERISTIC	NOTES	FIG.	MIN	TYP	MAX	UNIT
OPEN-LOOP VOLTAGE GAIN	R_S=200Ω, R_L = 2k	1	2×10^4	3×10^4	—	V/V
COMMON-MODE REJECTION RATIO	f = 100Hz	2	70	80	—	
COMMON-MODE INPUT IMPEDANCE	f = 100Hz		—	120	—	MOHMS
DIFFERENTIAL INPUT IMPEDANCE	f = 100Hz, OPEN-LOOP		—	40	—	kOHMS
INPUT NOISE VOLTAGE	R_S=200Ω, f = 20 – 20000Hz	3	—	0.5	0.55	µV
INPUT OFFSET VOLTAGE			—	10	20	mV
INPUT BIAS CURRENT			—	-1	-1.5	µA
INPUT OFFSET CURRENT			—	0.2	0.5	µA
COMMON-MODE INPUT VOLTAGE SWING			±12	±13	—	V
OUTPUT VOLTAGE SWING	R_L = 2k R_L = 80Ω	4	±13 ±11.5	±13.5 ±12	— —	V V
SLEW RATE	A_V = 1, 4-5 SHORTED (47pF INTERNAL) A_V = 10, C_F = 10pF $A_V \geq 20$, C_F = 0pF		4 18 45	5 20 50	— — —	V/µs V/µs V/µs
POWER BANDWIDTH	V_{OUT} = 20_{p-p}, R_L = 150Ω A_V = 1, 4-5 SHORTED (47pF INTERNAL) A_V = 10, C_F = 10pF $A_V \geq 20$, C_F = 0pF	4	— — —	70 300 500	— — —	kHz kHz kHz
PHASE MARGIN	4-5 SHORTED, 47pF INTERNAL		—	70	—	DEGREES
OUTPUT IMPEDANCE	f = 100Hz, OPEN-LOOP		—	250	—	Ω
POWER SUPPLY REJECTION RATIO	$R_S \leq$ 1k, V^+ V^-		— —	3 100	10 200	µV/V µV/V
POWER SUPPLY CURRENT	V_{OUT} = 0		—	±6.5	±9	mA
SHORT-CIRCUIT OUTPUT CURRENT			— —	+220 -180	— —	mA

TYPICAL CHARACTERISTICS ($V^+ = +15V$, $V^- = -15V$, $T_A = +25°C$)

FIGURE 1 - OPEN-LOOP VOLTAGE GAIN VERSUS FREQUENCY

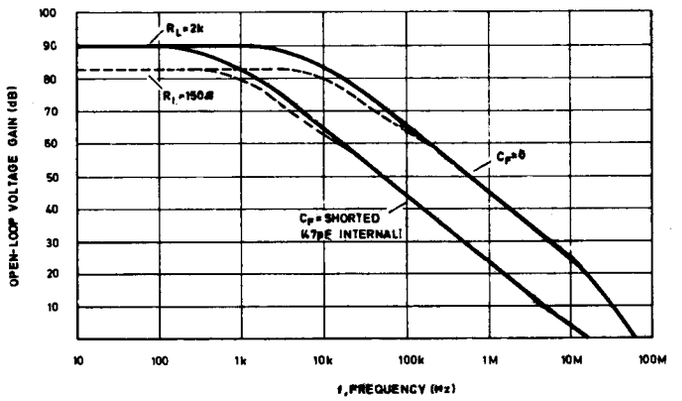


FIGURE 2 - COMMON-MODE REJECTION RATIO VERSUS FREQUENCY

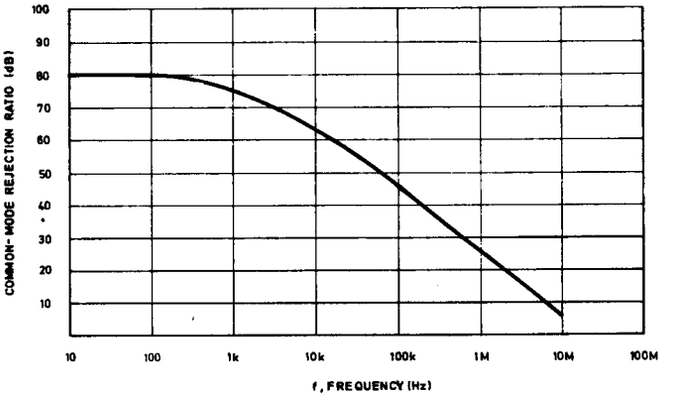


FIGURE 3 - INPUT NOISE VOLTAGE VERSUS SOURCE RESISTANCE, f = 20Hz...20kHz

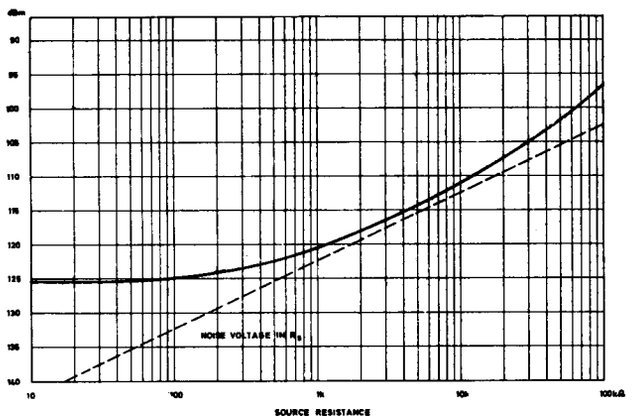


FIGURE 4 - POWER BANDWIDTH

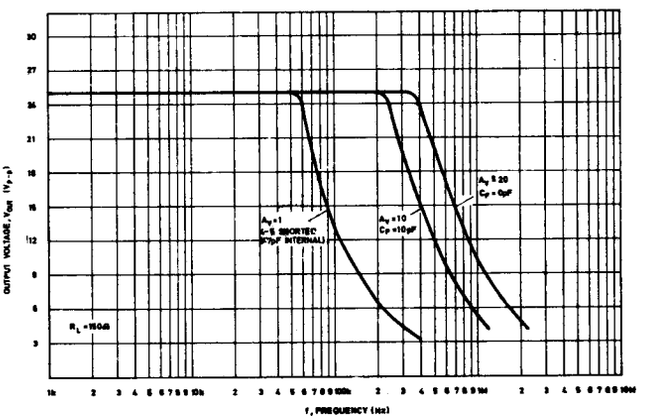


FIGURE 5 — FREQUENCY COMPENSATION

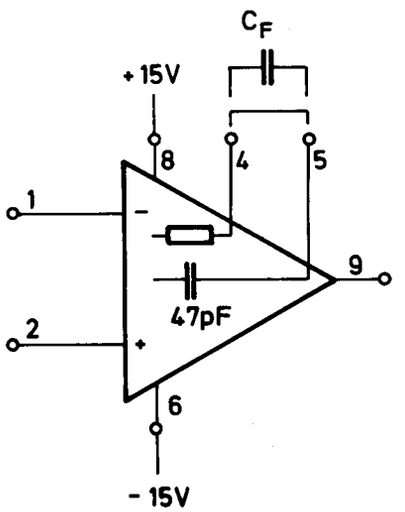
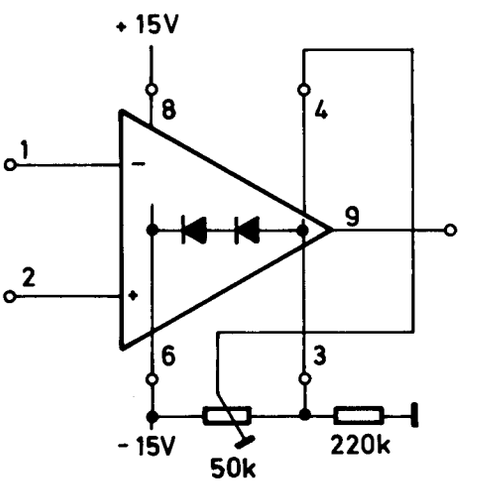


FIGURE 6 — OFFSET ADJUST



TYPICAL APPLICATIONS

FIGURE 7—SYMMETRICAL SUPPLY VOLTAGE

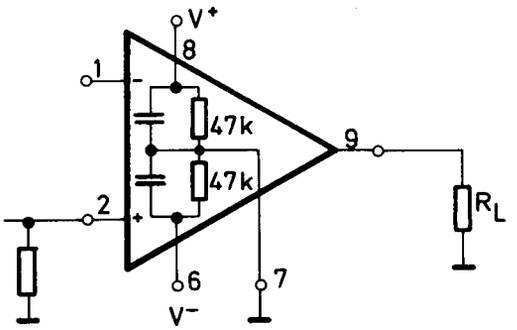


FIGURE 8 — ONE SUPPLY VOLTAGE

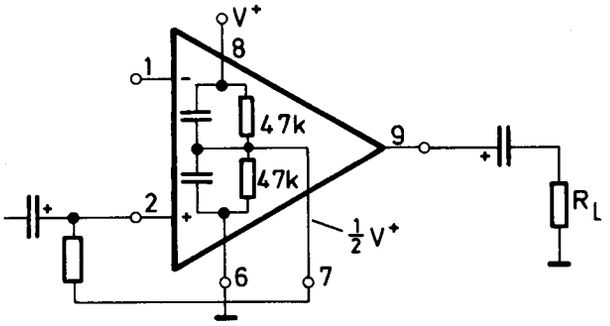


FIGURE 9—MICROPHONE AMPLIFIER
A_V = 60dB
INPUT NOISE VOLTAGE ≦ 0.45μV,
f = 20Hz — 20kHz

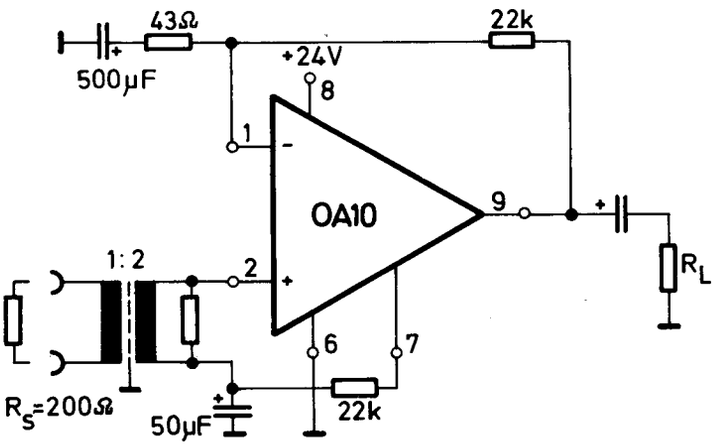
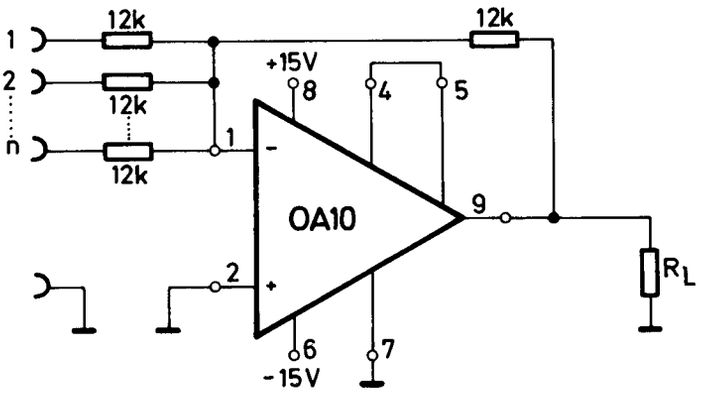


FIGURE 10 — MIXER AMPLIFIER
A_V = 0dB
INPUT TO INPUT REJECTION RATIO
R_S = 200Ω, f = 0 - 1kHz ≧ 110dB
f = 0 - 20kHz ≧ 90dB



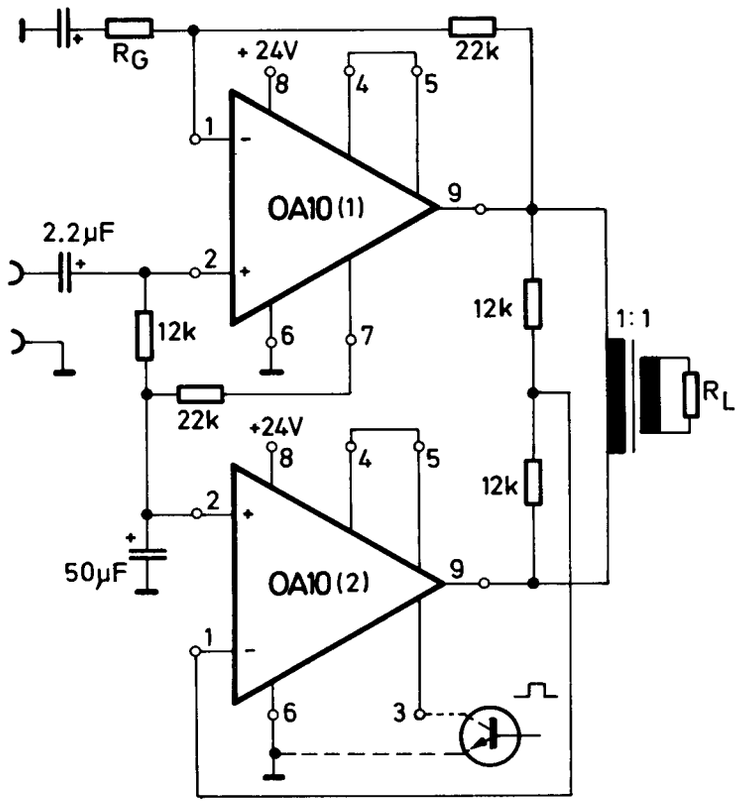


FIGURE 11 — PUSH-PULL POWER AMPLIFIER
A_V = 6 ... 40 dB (R_g = ∞ ... 430Ω)
MAXIMUM SINE WAVE OUTPUT POWER: 1.4W

WHEN SHORTING 3 WITH 6 OF THE OA10, THE INPUTS AND THE OUTPUT ARE CURRENTLESS. USING FOR THIS PURPOSE A TRANSISTOR ACROSS 3 AND 6 OF OA10(2), A CURRENT PULSE THROUGH THE OUTPUT TRANSFORMER AFTER SWITCH ON AND DURING CHARGING OF CAPACITORS CAN BE OMITTED.