LINEAR INTEGRATED CIRCUIT

TDA 1420

PRELIMINARY DATA

MONOLITHIC QUASI-COMPLEMENTARY DUAL DARLINGTON IN PENTAWATT® PACKAGE

The TDA 1420 is a monolithic integrated circuit in Pentawatt® plastic package consisting of a pair of quasi-complementary (NPN-PNP) darlingtons with the associated biasing system. Each darlington can deliver a current in excess of 3A and can withstand a supply voltage of 44V. The device is intended for applications as:

- booster for operational amplifier
- DC motor driver
- stepping motor driver
- output stage for AC power amplifier up to 20W in Hi-Fi systems
- output stage for vertical deflection systems in colour TV etc.

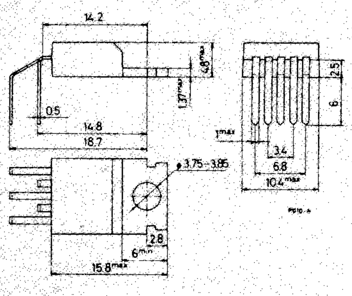
ABSOLUTE MAXIMUM RATINGS

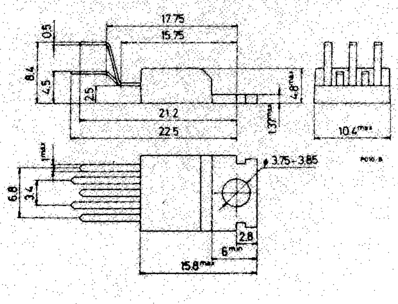
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	44	V
V_{CBO}	Collector-base voltage ($I_E = 0$)	55	V
I_o	Output peak current (repetitive)	3.5	A
I_o	DC output current	3	A
$I_{F\ D1}$	D1 forward current	0.3	A
$I_{F\ D2}$	D2 forward current	3	A
P_{tot}	Total power dissipation at $T_{case} = 60°C$	30	W
T_j, T_{stg}	Junction and storage temperature	-40 to 150	°C

ORDERING NUMBERS: TDA 1420 H
TDA 1420 V

MECHANICAL DATA

Dimensions in mm





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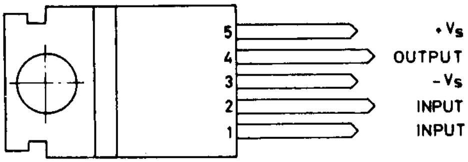
CONNECTION AND SCHEMATIC DIAGRAMS



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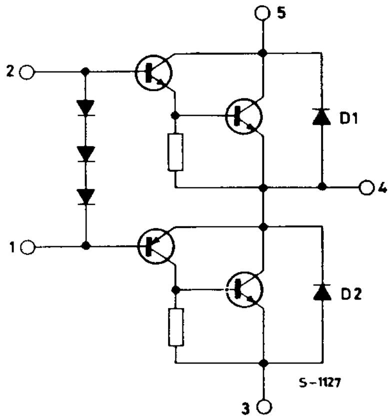

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THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max.	3	°C/W

ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C)

Parameter		Test conditions		Min.	Typ.	Max.	Unit
V_{CEO}	Collector-emitter breakdown voltage	I_C = 500 μA		44			V
V_{CBO}	Collector-base breakdown voltage			55			V
$V_{(BR)CSSO}$	Collector-substrate breakdown voltage			60			V
$h_{FE(NPN)}$	DC forward current transfer ratio	I_C = 3A	V_{CE} = 5V	1000	2500		–
$h_{FE(PNP)}$	DC forward current transfer ratio	I_C = -3A	V_{CE} = -5V	500	1000		–

ELECTRICAL CHARACTERISTICS (continued)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
I_d	Quiescent drain current	I_{2-1} = 5 mA V_s = 40V		20		mA
$V_{CE(sat)}$	Collector-emitter saturation voltage (NPN-PNP)	I_C = |3A| h_{FE} = 200		|2.3|	|2.7|	V
$V_{BE(NPN)}$	Base-emitter voltage (pins 2-4)	I_C = 3A		2.5		V
$V_{BE(PNP)}$	Base-emitter voltage (pins 1-4)	I_C = -3A		-1.2		V
$V_{F(D1)}$	D1 forward voltage	V 3-5 = -40V $I_{F(D1)}$ = 0.3A		1.7		V
$V_{F(D2)}$	D2 forward voltage	$I_{F(D2)}$ = 3A		5		V
$f_{T(NPN)}$	Cutoff frequency	I_C = 2A V_{CE} = 10V	10			MHz
$f_{T(PNP)}$	Cutoff frequency	I_C = -2A V_{CE} = -10V	5			MHz

Fig. 1 - Typical quiescent drain current vs. I_{2-1}

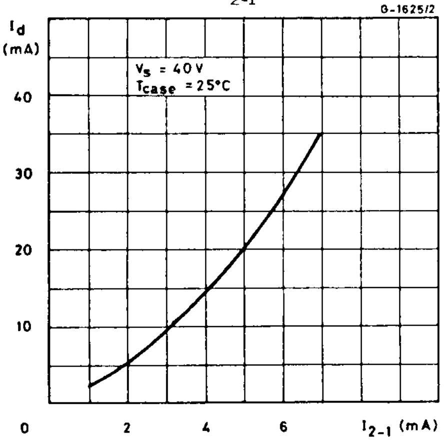


Fig. 2 - Typical quiescent drain current vs. case temperature

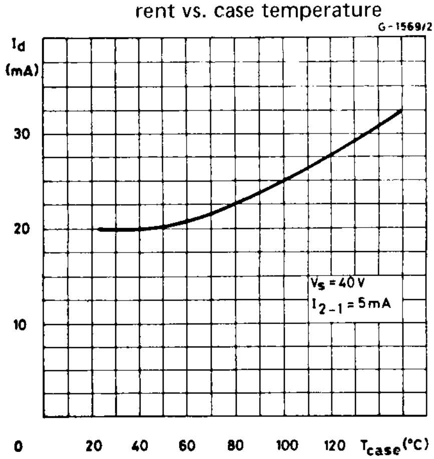


Fig. 3 - Typical quiescent drain current vs. supply voltage

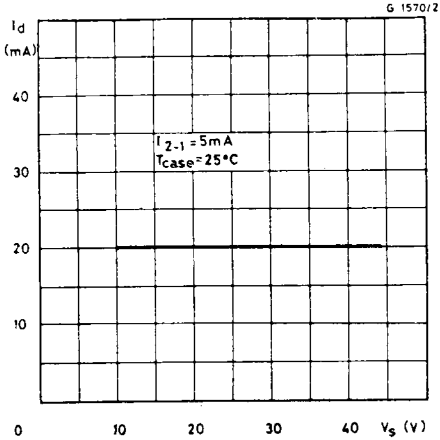


Fig. 4 - Typical DC current gain vs. collector current

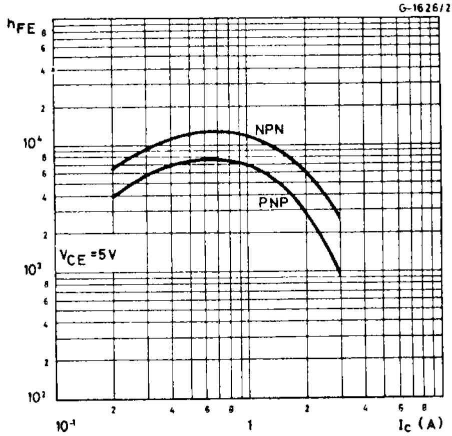


Fig. 5 - Typical $V_{CE(sat)}$ vs. collector current

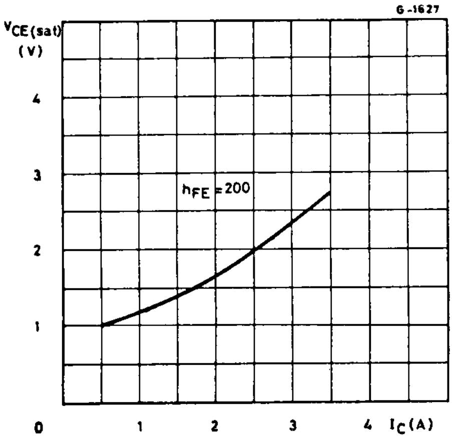


Fig. 6 - Typical V_{BE} vs. collector current

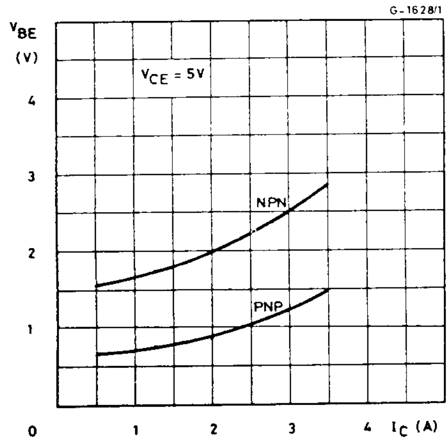


Fig. 7 - Typical pulse response (rising edge)

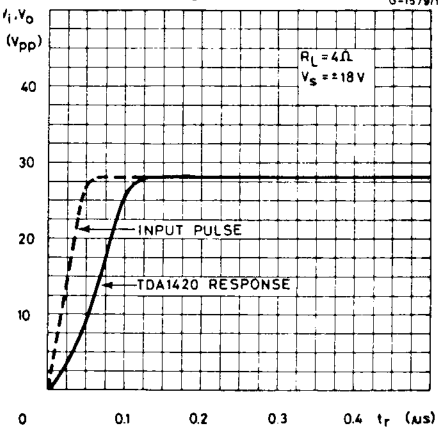


Fig. 8 - Typical pulse response (falling edge)

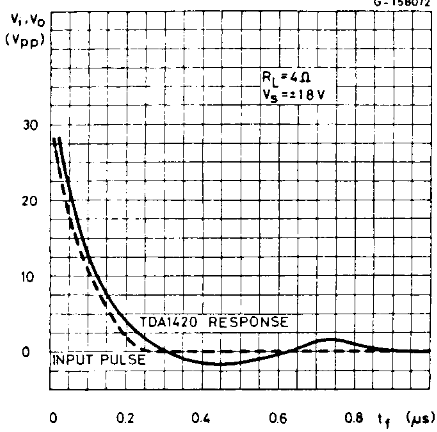


Fig. 9 - Typical output voltage swing

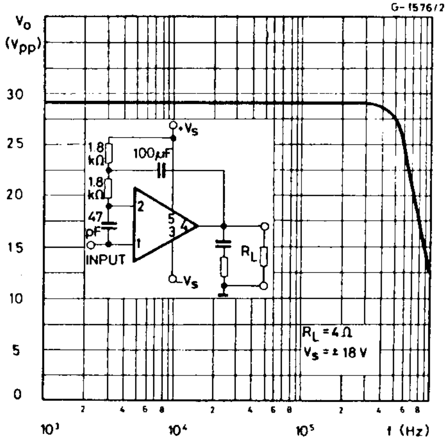
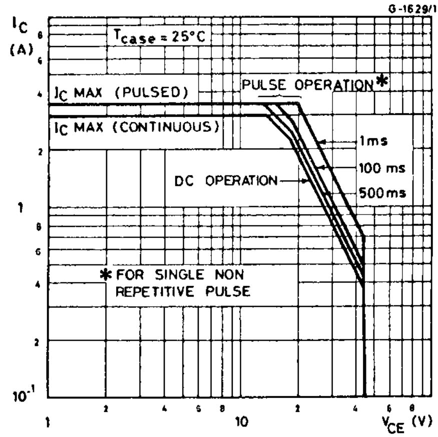


Fig. 10 - Safe operating areas



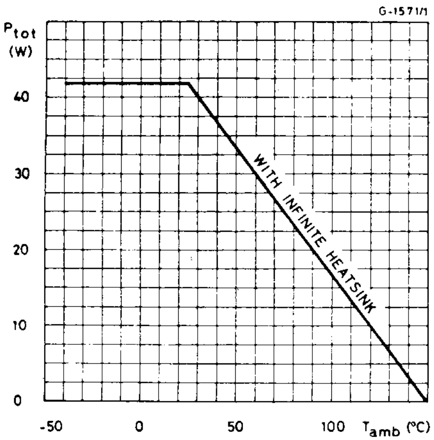
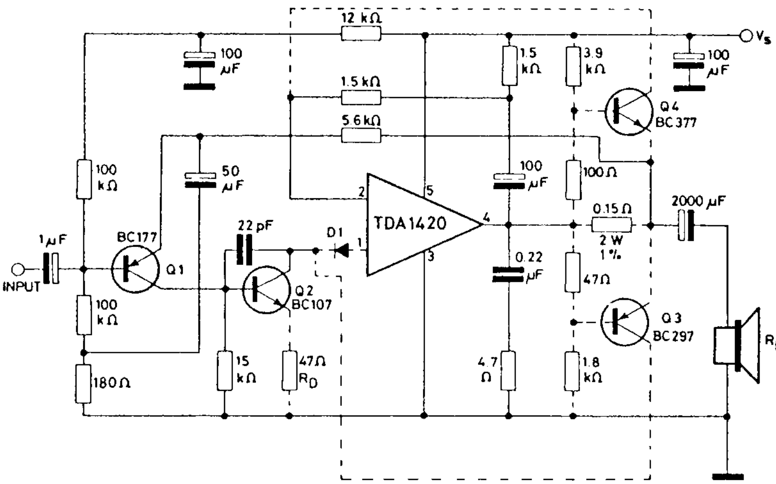


Fig. 11 - Derating characteristic

APPLICATION INFORMATION

Fig. 12- Hi-Fi audio amplifier with short circuit protection



Typical performance of circuit in fig. 12

	Parameter	Test conditions	Min.	Typ.	Max.	Unit
P_o	Output power	d = 1% G_v = 30 dB f = 40 to 15,000 Hz V_s = 34V $R_L = 4\Omega$ V_s = 36V $R_L = 8\Omega$	 20 15	 22 17		 W W
		d = 10% G_v = 30 dB f = 1 kHz V_s = 34V $R_L = 4\Omega$ V_s = 36V $R_L = 8\Omega$		 30 20		 W W
B	Frequency response (-3 dB)	V_s = 34V $R_L = 4\Omega$ G_v = 30 dB		20 to 100,000		Hz
I_d	Drain current	V_s = 34V $R_L = 4\Omega$ P_o = 30W		1.3		A
		V_s = 36V $R_L = 8\Omega$ P_o = 20W		720		mA

Fig. 13 - Output characteristics of the protected class B stage

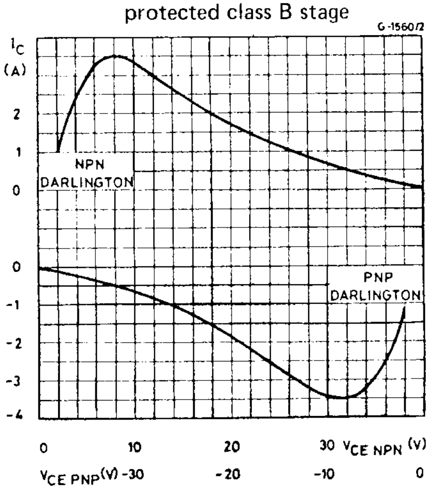


Fig. 14 - Typical distortion vs. output power ($R_L = 4\Omega$)

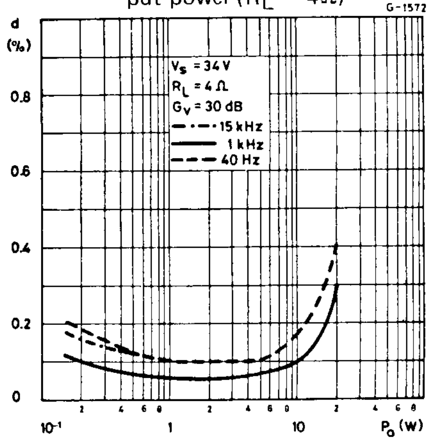


Fig. 15 - Typical distortion vs. output power ($R_L = 4\Omega$)

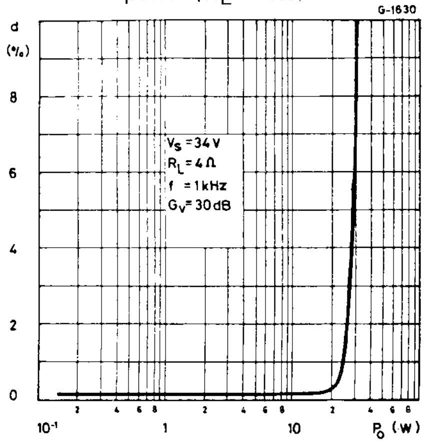


Fig. 16 - Sensitivity vs. output power ($R_L = 4\Omega$)

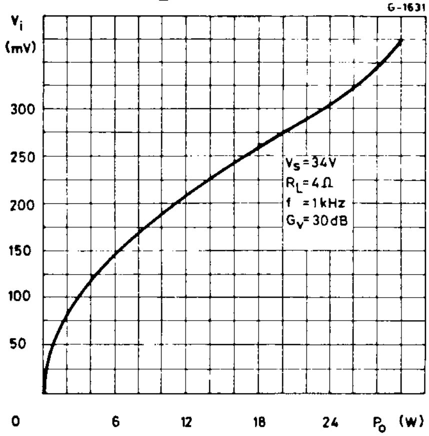


Fig. 17 - Typical power dissipation and efficiency vs. output power ($R_L = 4\Omega$)

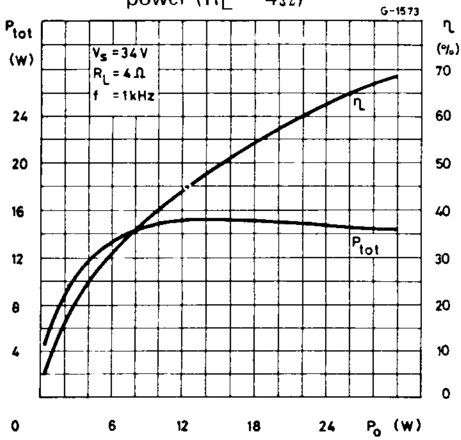


Fig. 18 - Typical distortion vs. output power ($R_L = 8\Omega$)

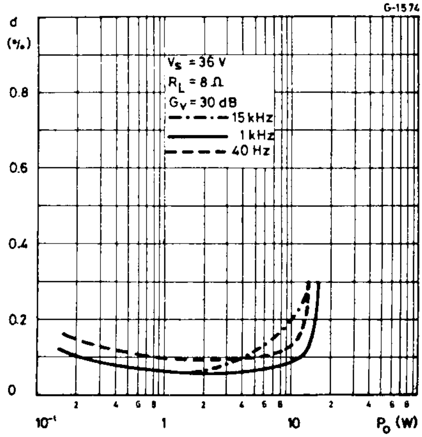


Fig. 19 - Typical distortion vs. output power ($R_L = 8\Omega$)

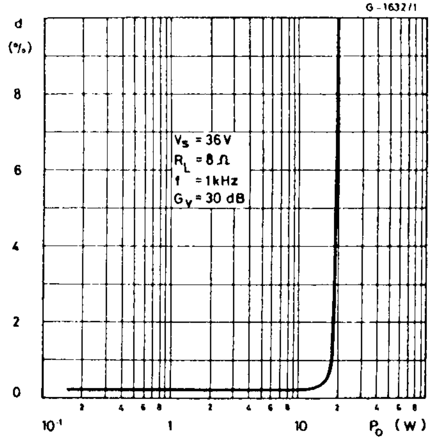


Fig. 20 - Typical sensitivity vs. output power ($R_L = 8\Omega$)

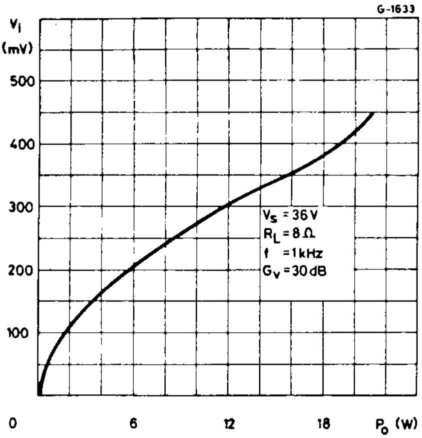


Fig. 21 - Typical power dissipation and efficiency vs. output power ($R_L = 8\Omega$)

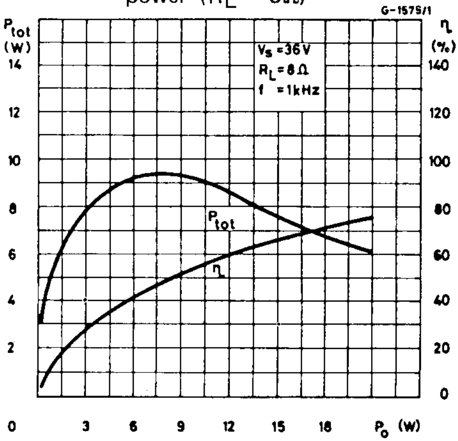


Fig. 22 - Typical output power vs. supply voltage

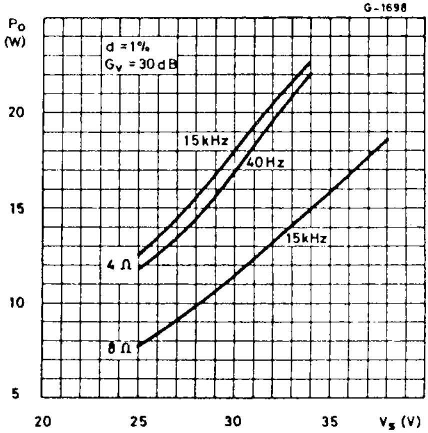


Fig. 23 - Hi-Fi stereo amplifier with preamplifier-equalizer for magnetic pick-ups. The final stage is identical to fig. 12.

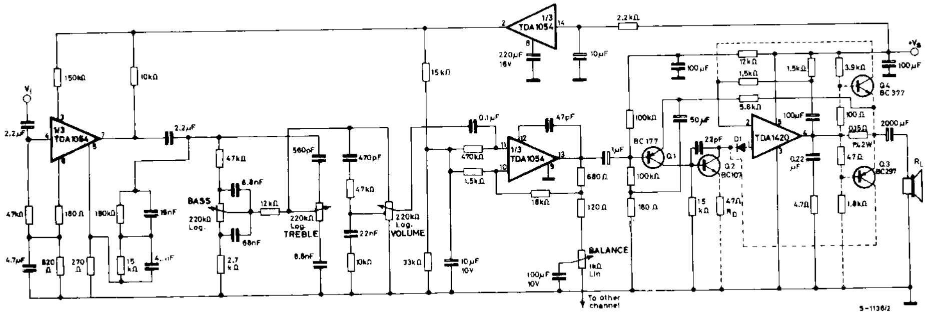
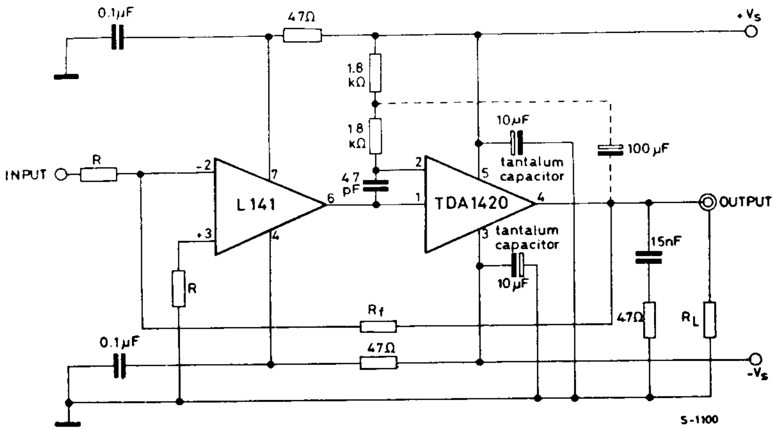


Fig. 24 - Booster for operational amplifier



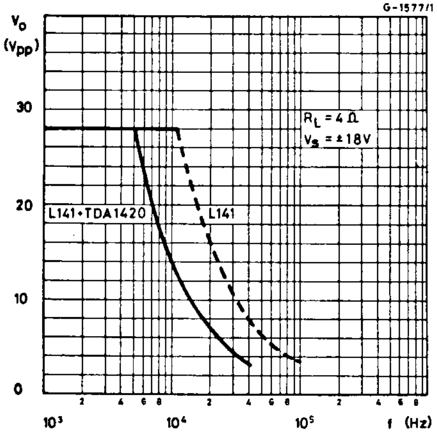


Fig. 25 - L 141 + TDA 1420 output voltage swing vs. frequency

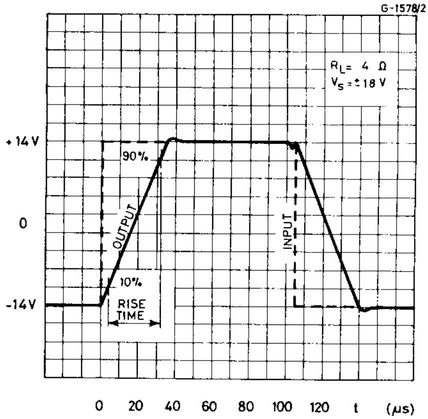


Fig. 26 - L 141 + TDA 1420 transient response

Performance of circuit in fig. 24

	L 141 + TDA 1420
Max. supply voltage	± 22V
Max. power dissipation	30W at $T_{case} = 60°C$
Input offset voltage	⩽ 5 mV
Input offset current	⩽ 200 nA
Input bias current	⩽ 500 nA
Voltage gain	⩾ 86 dB ($R_L = 4\Omega$)
Max. DC output current	3A

Fig. 27 - Position control of DC motor

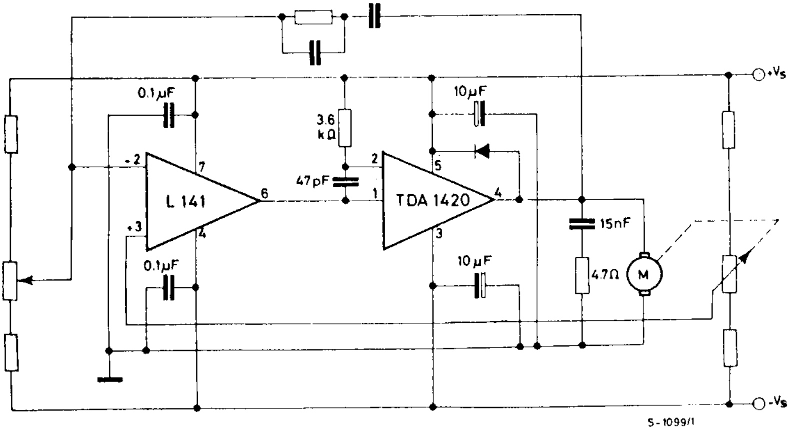


Fig. 28 - Stepping motor driver

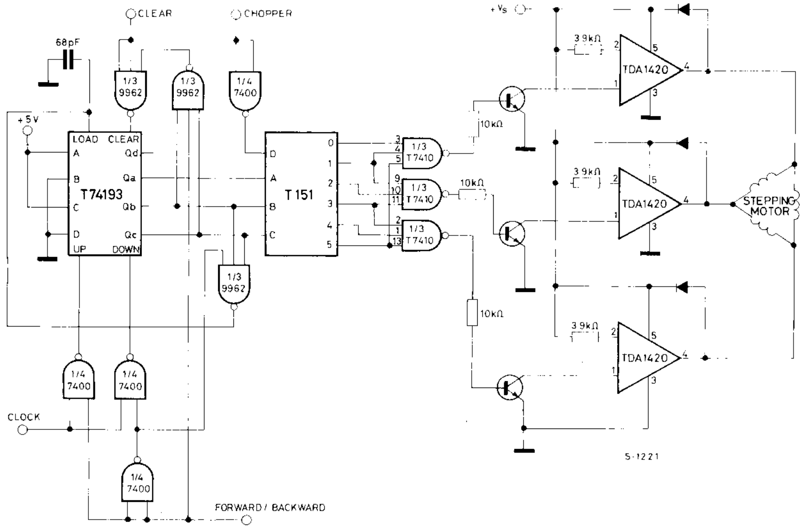


Fig. 29 - Bidirectional speed control of DC motor

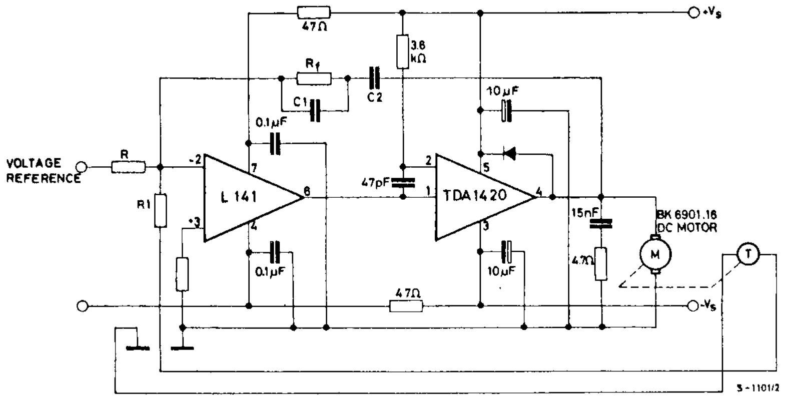


Fig. 30 - Programmable supply voltage

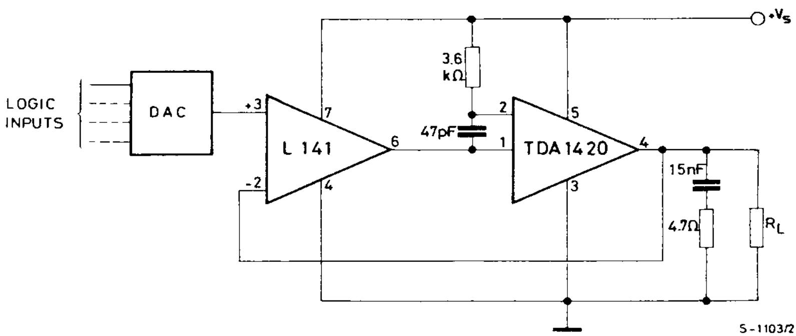


Fig. 31 - Output stage for vertical deflection system