OPERATIONAL AMPLIFIER

The TCA520 is a silicon monolithic integrated circuit primarily intended for use in low power, low voltage applications and as comparator in digital systems.
Special features are:

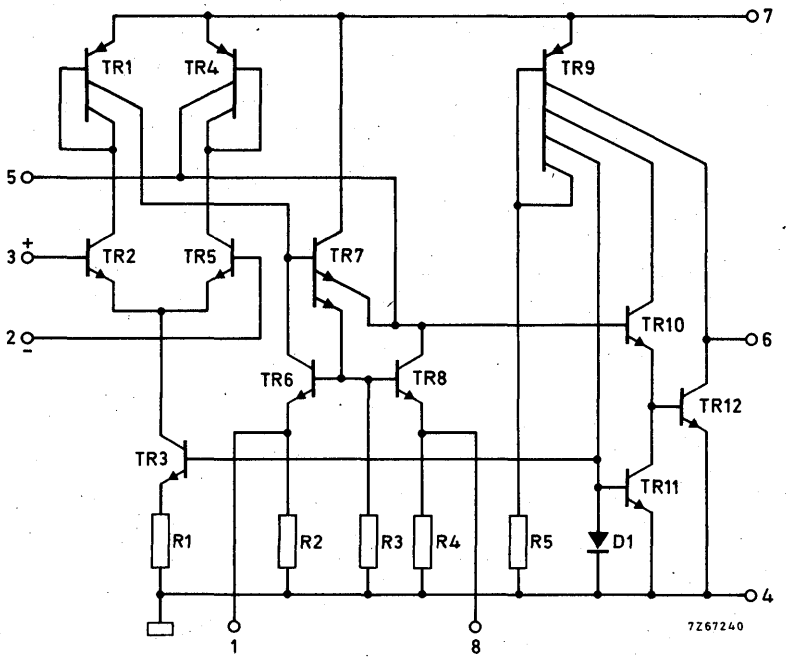
- large supply voltage range : 2 to 20 V
- offset voltage adjustable to zero
- output TTL-compatible
- low power consumption : 5 mW at 5 V
- high slew rate (comparator) : 50 V/µs
- low input bias current : 30 nA

QUICK REFERENCE DATA				
Supply voltage	V_P	nom.	5	V
Output sink current	I_{sink}	typ.	12	mA
Input current	I_i	typ.	30	nA
Slew rate (comparator)	S	typ.	50	V/µs

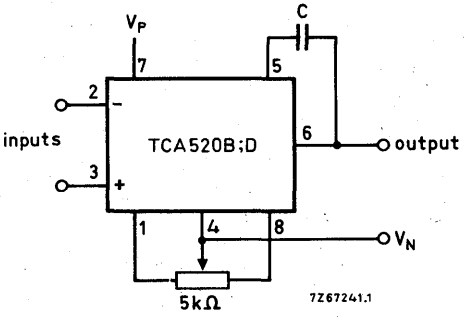
PACKAGE OUTLINES (see general section).

TCA520B : SOT-97 (plastic 8-lead dual in-line).
TCA520D : SOT-96A (plastic 8-lead flat pack).

CIRCUIT DIAGRAM



CONNECTION DIAGRAM AND PINNING



1. Balance
2. Inverting input
3. Non-inverting input
4. Negative supply (V_N)
5. Frequency compensation
6. Output
7. Positive supply (V_P)
8. Balance

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

Voltages

Positive supply voltage	V_P	max.	11	V
Negative supply voltage	$-V_N$	max.	11	V
Differential input voltage	$\pm V_{2-3}$	max.	6	V

Temperatures

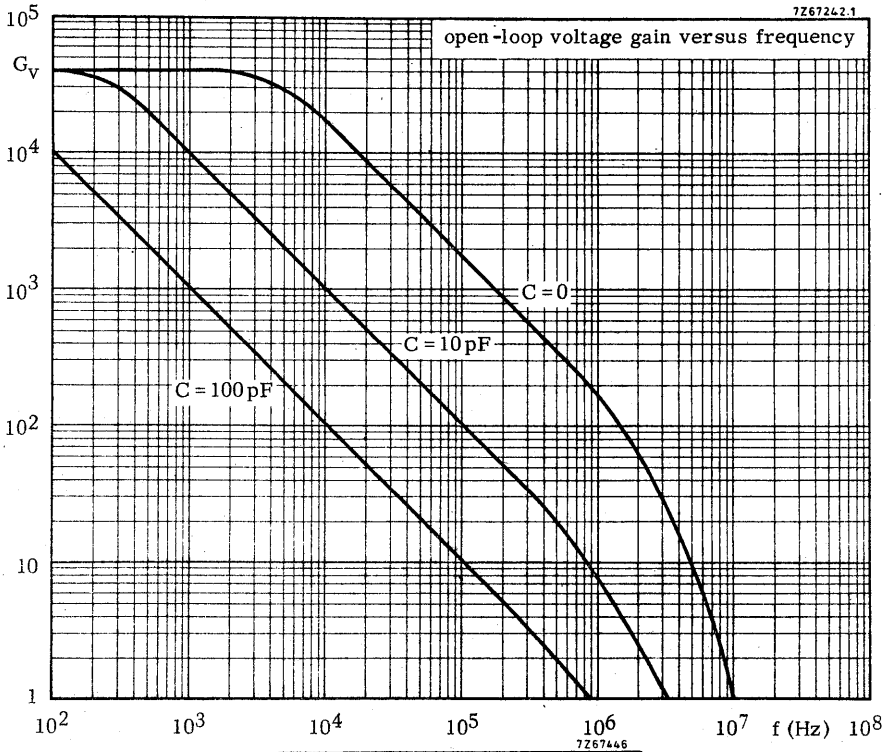
Operating ambient temperature	T_{amb}	−25 to	+85	°C
Storage temperature	T_{stg}	−65 to	+125	°C

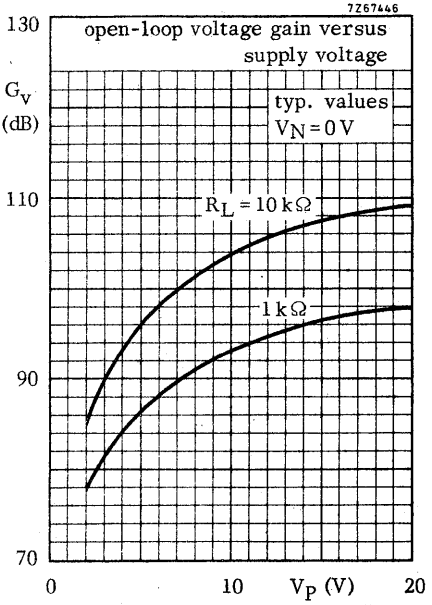
Maximum power dissipation in free air

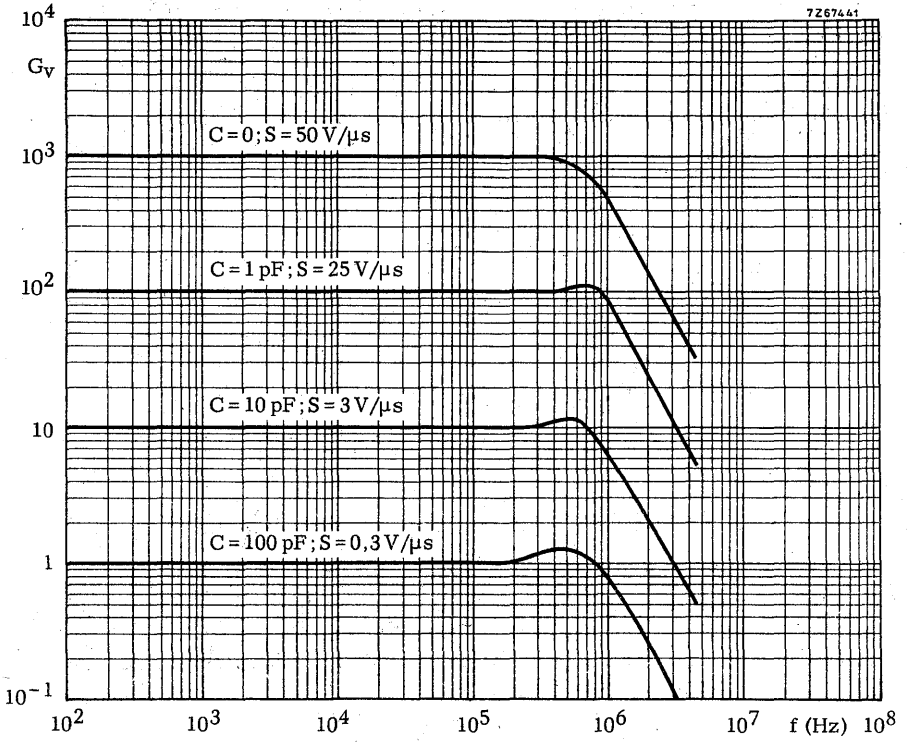
package	mounting	max. power dissipation at T_{amb} = 50 °C (mW)	derating factor for T_{amb} > 50 °C (mW/°C)	thermal resistance $R_{th\ j-a}$ (°C/W)
SOT-97	on PC board	375	5	200
SOT-96A	on ceramic substrate (4 cm^2)	440	5,8	170
SOT-96A	on PC board (4 cm^2)	300	4	250

CHARACTERISTICS V_P = 5 V; V_N = 0 V; T_{amb} = 25 °C; R_L connected between output (pin 6) and positive supply (pin 7)

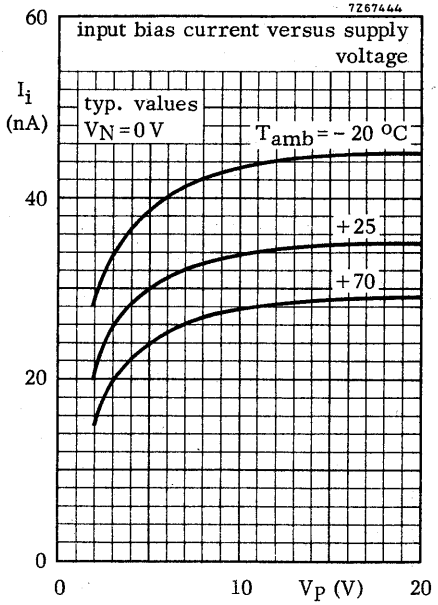
Input offset voltage	V_{io}	typ. 	1 6	mV mV
Input offset voltage drift	ΔV_{io}	typ.	5	μV/°C
Input bias current	I_i	typ. 	30 100	nA nA
Input offset current	I_{io}	typ. 	5 30	nA nA
Input voltage range	V_i	> >	V_N + 0,9 V_P − 0,5	V V
Common mode rejection ratio	CMRR	> typ.	70 100	dB dB
D.C. voltage gain at R_L = 5 kΩ	G_v	> typ.	25 000 50 000	
A.C. voltage gain at f = 1 kHz; C = 100 pF	G_v	 typ.	600 to 1800 1000	
Output voltage range at R_L = 5 kΩ	V_o	> >	V_N + 0,1 V_P − 0,1	V V
Output sink current at $V_o = V_N + 0,4$ V	I_{sink}	> typ.	8 12	mA mA
Output source current at $V_o \leq V_P - 0,4$ V	I_{source}	> typ.	0,13 0,20	mA mA
Supply current at I_o = 0	$I_{P;N}$	typ. 	1 1,5	mA mA
Slew rate at C = 100 pF; R_L = 1 kΩ at C = 0; R_L = 1 kΩ	S S	typ. typ.	0,3 50	V/μs V/μs
Input noise voltage at f = 1 kHz	V_n	typ.	15	$nV/\sqrt{Hz}$
Input noise current at f = 1 kHz	I_n	typ.	0,2	$pA/\sqrt{Hz}$

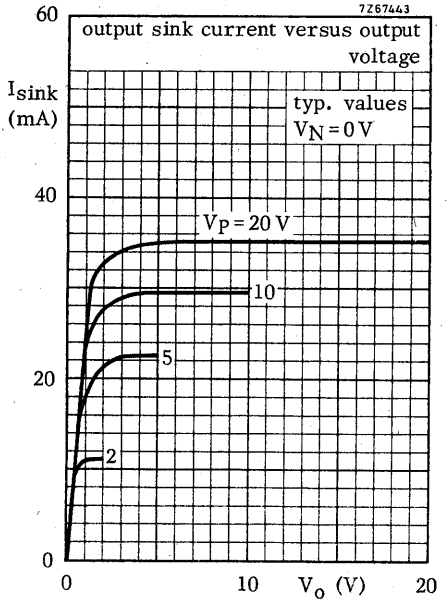

7Z67242.1
open-loop voltage gain versus frequency
10^5
G_v
10^4
10^3
10^2
10
1
C = 0
C = 10 pF
C = 100 pF
10^2
10^3
10^4
10^5
10^6
10^7
f (Hz)
10^8

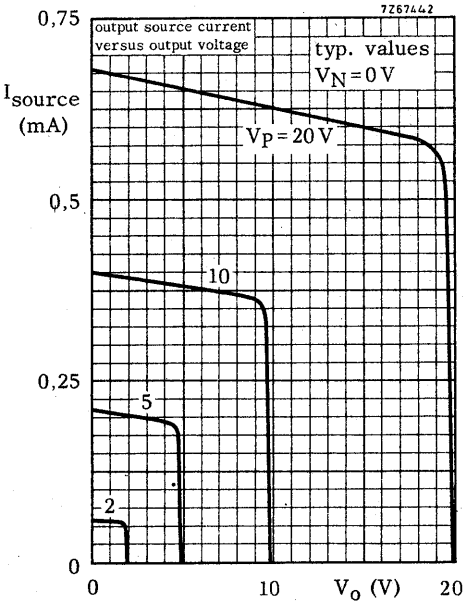

7Z67446
130
open-loop voltage gain versus supply voltage
G_v (dB)
typ. values
V_N = 0 V
110
R_L = 10 kΩ
1 kΩ
90
70
0
10
V_P (V)
20

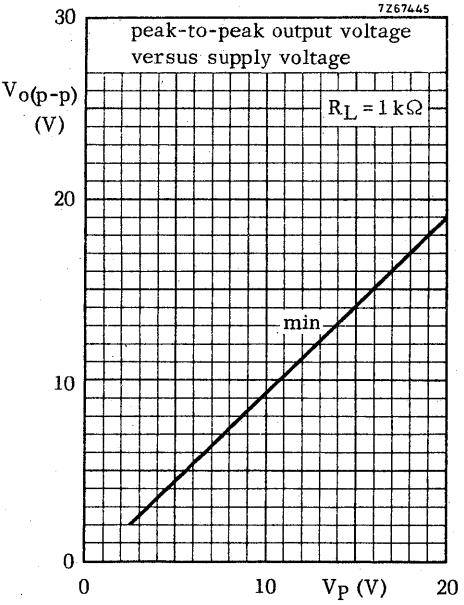


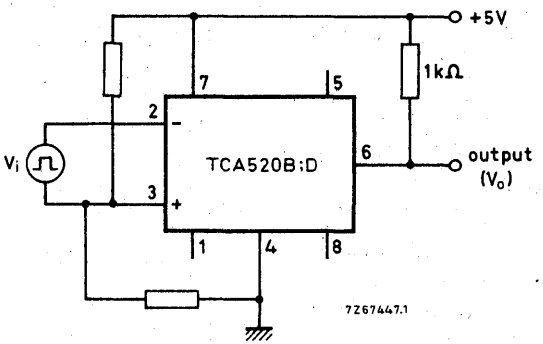
Frequency response and slew-rate for various closed-loop gains

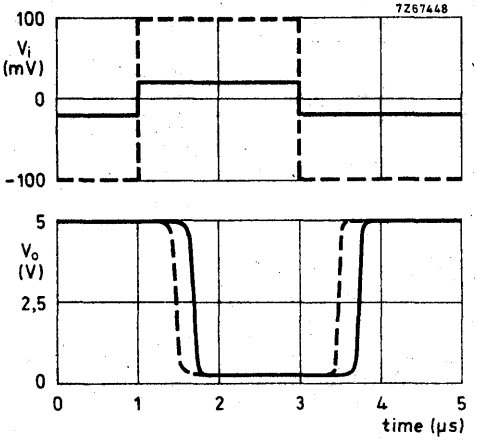

7Z67444
input bias current versus supply voltage
typ. values
$V_N = 0$ V
$T_{amb} = -20$ °C
+25
+70
I_i (nA)
60
40
20
0
0
10
V_P (V)
20


7Z67443
output sink current versus output voltage
typ. values
$V_N = 0$ V
I_{sink} (mA)
60
40
20
0
$V_P = 20$ V
10
5
2
0
10
V_o (V)
20

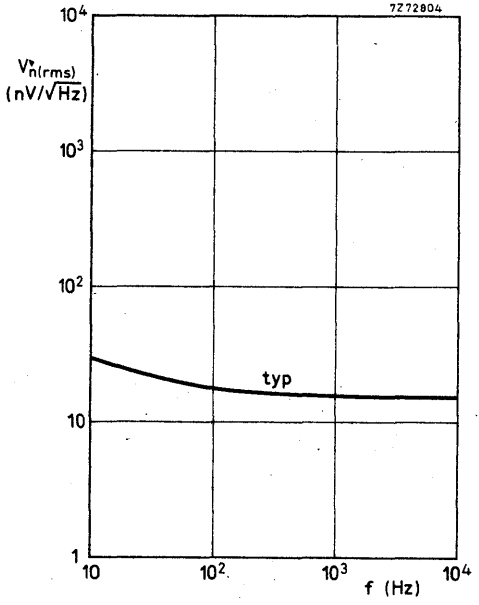

7Z67442
output source current versus output voltage
typ. values
$V_N = 0$ V
I_{source} (mA)
0,75
0,5
0,25
0
$V_P = 20$ V
10
5
2
0
10
V_o (V)
20

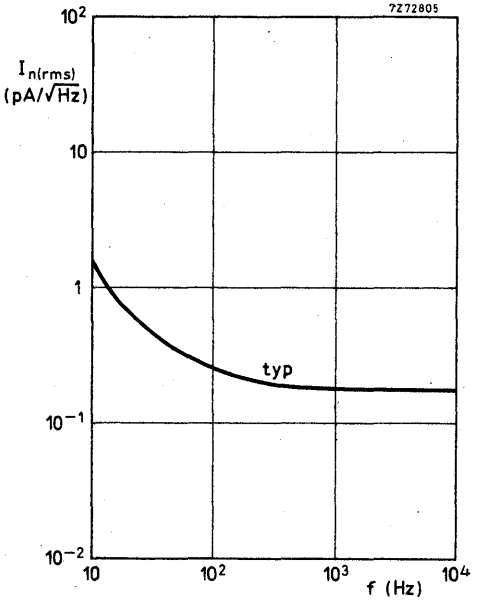

7Z67445
peak-to-peak output voltage versus supply voltage
$R_L = 1$ kΩ
$V_{o(p-p)}$ (V)
30
20
10
0
min
0
10
V_P (V)
20





The TCA520B;D used as a comparator; pulse delays when the circuit is 20 or 100 mV overdriven.


7Z72804
$V_{n(rms)}$
(nV/√Hz)
10^4
10^3
10^2
10
1
typ
10
10^2
10^3
10^4
f (Hz)


7Z72805
$I_{n(rms)}$
(pA/√Hz)
10^2
10
1
10^{-1}
10^{-2}
typ
10
10^2
10^3
10^4
f (Hz)