

OPERATIONAL AMPLIFIER

GENERAL DESCRIPTION

The TCA520 is a bipolar integrated operational amplifier primarily intended for low-power, low-voltage applications and as a comparator in digital systems.

Features

- Wide supply voltage range
- Low supply voltage operation
- Low power consumption
- Low input bias current
- Offset compensation facility
- Frequency compensation facility
- High slew rate
- Large output voltage swing
- TTL compatible output

QUICK REFERENCE DATA

Supply voltage range	V_{CC}	2 to 20 V
Supply current	I_{CC}	typ. 0,8 mA
Input bias current	I_{IB}	typ. 60 nA
Output voltage range	V_Q	0,1 to $V_{CC}-0,1$ V
D.C. differential voltage amplification	A_{VD}	typ. 15 000
Slew rate	S_{VOAV}	typ. 25 V/ μ s
Operating ambient temperature range	T_{amb}	-25 to +85 °C

PACKAGE OUTLINES

TCA520B : 8-lead DIL; plastic (SOT97).

TCA520D: 8-lead mini-pack; plastic (SO8; SOT96A).

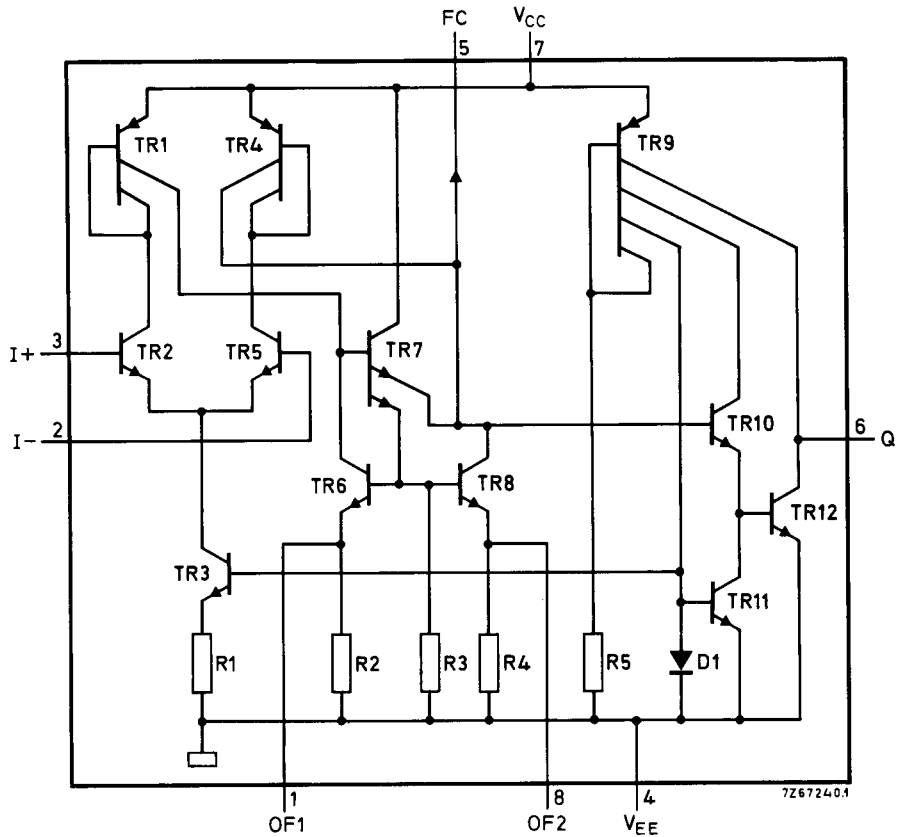
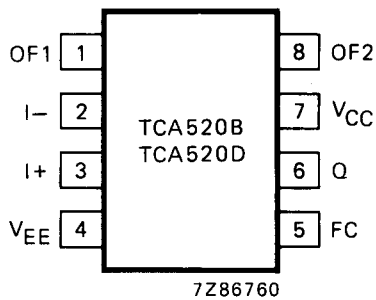


Fig. 1 Circuit diagram.



PINNING

- | | | |
|---|-----|-----------------------------------|
| 1 | OF1 | offset compensation connection |
| 2 | I- | inverting input |
| 3 | I+ | non-inverting input |
| 4 | VEE | ground connection |
| 5 | FC | frequency compensation connection |
| 6 | Q | output |
| 7 | VCC | positive supply connection |
| 8 | OF2 | offset compensation connection |

Fig. 2 Pinning diagram.

RATINGS

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

Supply voltage, d.c.	V_{CC}	max.	22 V
Input voltage	V_I	max.	V_{CC} V
	$-V_I$	max.	0 V
Differential input voltage	$\pm V_{ID}$	max.	2 V
Power dissipation at $T_{amb} = 85^\circ\text{C}$	P_{tot}	max.	200 mW
Storage temperature range	T_{stg}		-55 to +125 °C
Operating ambient temperature range	T_{amb}		-25 to +85 °C

CHARACTERISTICS $V_{CC} = 5\text{ V}$; $V_{EE} = 0\text{ V}$; $T_{amb} = 25^\circ\text{C}$; R_L from Q to V_{CC} unless otherwise specified

parameter	symbol	min.	typ.	max.	unit
Supply V_{CC}: pin 7					
Supply current, unloaded	I_{CC}	0,5	0,8	1,2	mA
Inputs I+ and I-; pins 3 and 2					
Input voltage	V_I	0,9	—	$V_{CC}-0,5$	V
Input bias current	I_{IB}	—	60	250	nA
Input offset voltage	V_{IO}	—	1	6	mV
Variation with temperature	ΔV_{IO}	—	5	—	$\mu\text{V}/\text{K}$
Input offset current	I_{IO}	—	10	75	nA
Common-mode rejection ratio	kCMR	70	100	—	dB
Input noise voltage at $f = 1\text{ kHz}$	$V_n(\text{rms})$	—	15	—	$\text{nV}/\sqrt{\text{Hz}}$
Input noise current at $f = 1\text{ kHz}$	$I_n(\text{rms})$	—	0,4	—	$\text{pA}/\sqrt{\text{Hz}}$
Input noise angular frequency	f_c	—	300	—	Hz
Output Q; pin 6					
Output voltage range at $R_L = 5\text{ k}\Omega$	V_Q	0,1	—	$V_{CC}-0,1$	V
Output current					
HIGH at $V_Q = V_{CC} - 0,4\text{ V}$	$-I_{OH}$	100	200	—	μA
LOW at $V_Q = 0,4\text{ V}$	I_{OL}	6	12	—	mA
D.C. voltage amplification at $R_L = 5\text{ k}\Omega$	A_{VD}	10 000	15 000	—	
A.C. voltage amplification at $f = 1\text{ kHz}$; $C_{FC} = 100\text{ pF}$	A_{vd}	—	58	—	dB
Slew rate (average rate of change of the output voltage) at $R_L = 1\text{ k}\Omega$ $C_{FC} = 0\text{ pF}$	S_{VOAV}	—	25	—	$\text{V}/\mu\text{s}$
$C_{FC} = 100\text{ pF}$	S_{VOAV}	—	500	—	$\text{mV}/\mu\text{s}$

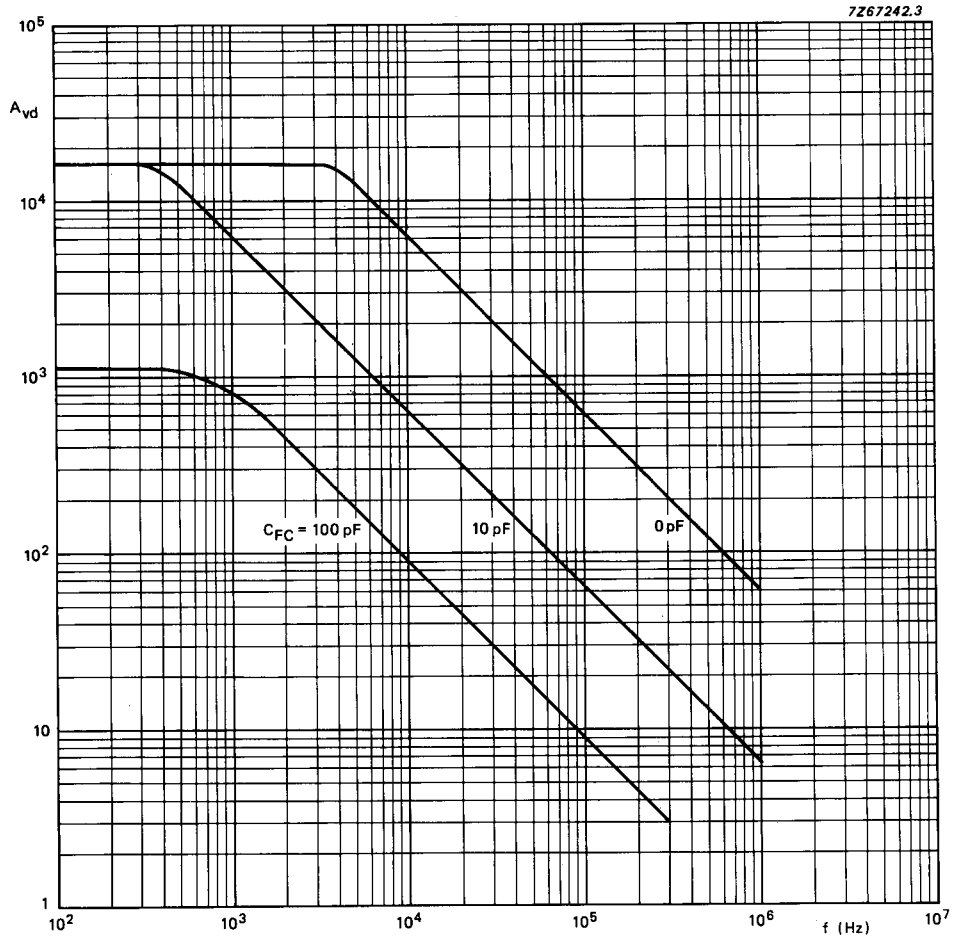


Fig. 3 Typical values of the open-loop voltage amplification as a function of frequency.

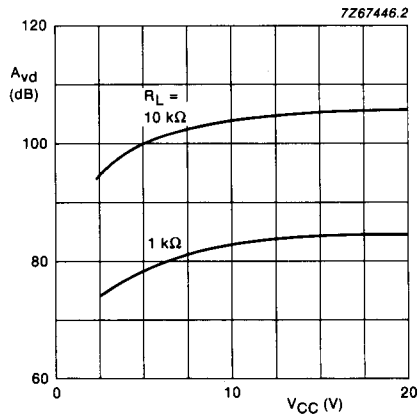


Fig. 4 Typical values of the open-loop voltage amplification as a function of supply voltage.

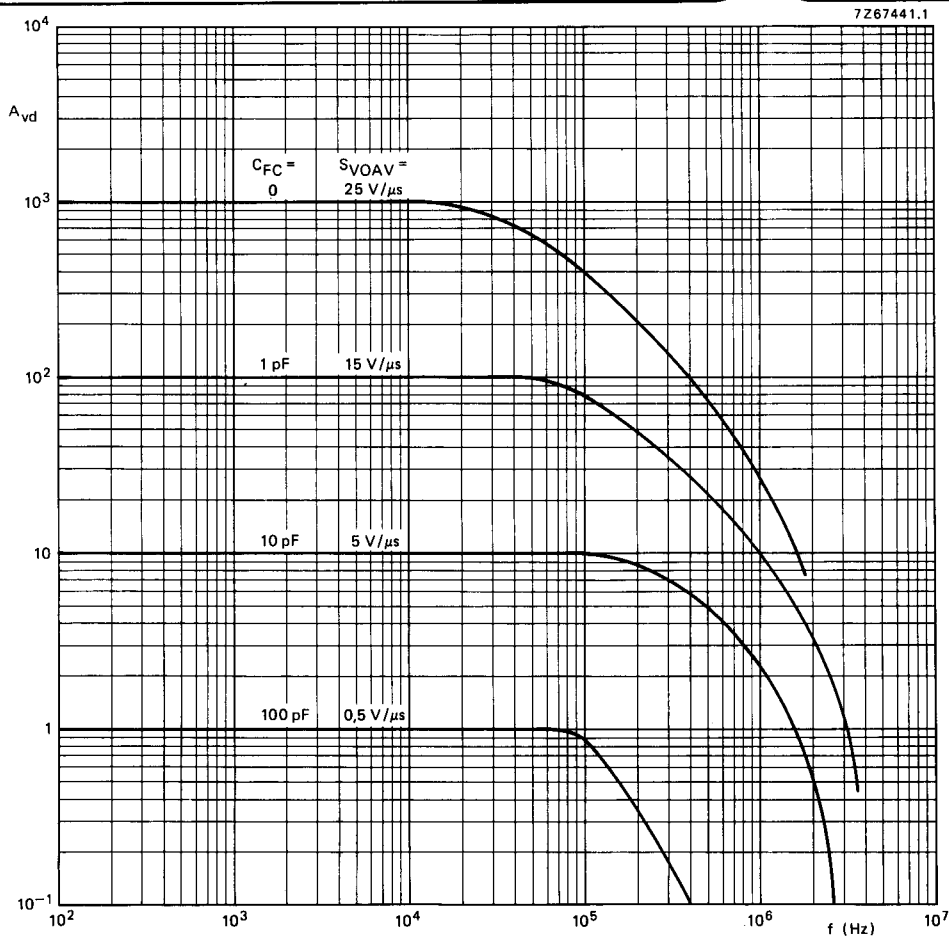


Fig. 5 Typical frequency response and slew rate for various closed-loop gains.

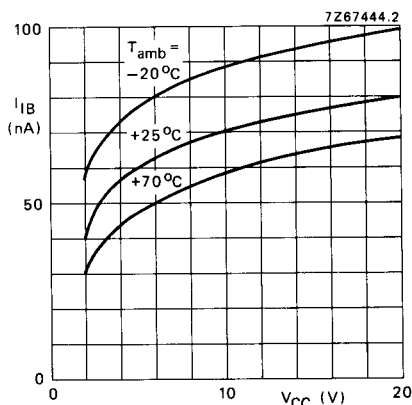


Fig. 6 Typical values of the input bias current as a function of supply voltage, with ambient temperature as a parameter.

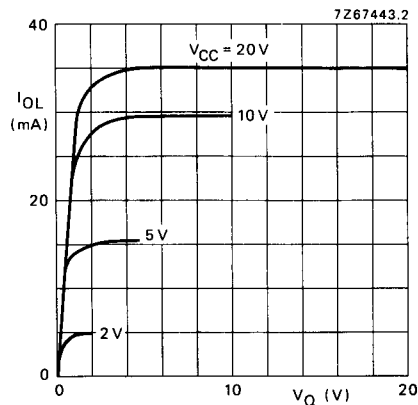


Fig. 7 Typical output current LOW as a function of output voltage, with supply voltage as a parameter.

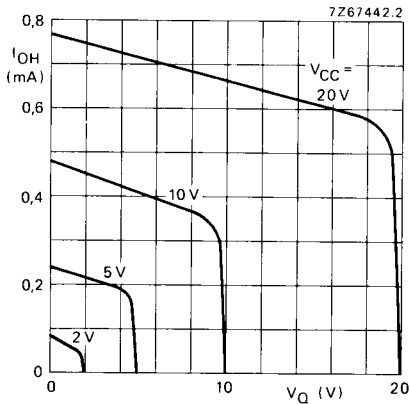


Fig. 8 Typical output current HIGH as a function of output voltage, with supply voltage as a parameter.

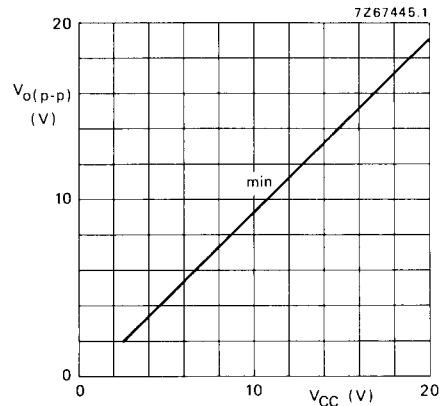


Fig. 9 Minimum values of the output voltage swing as a function of supply voltage for $R_L = 1 \text{ k}\Omega$.

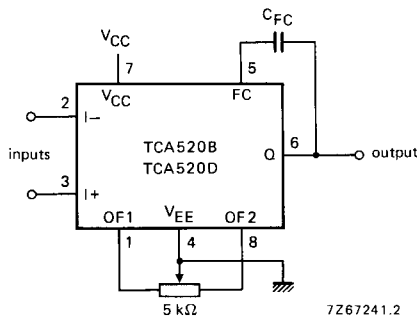


Fig. 10 Typical arrangement of the TCA520 with frequency and offset compensation.

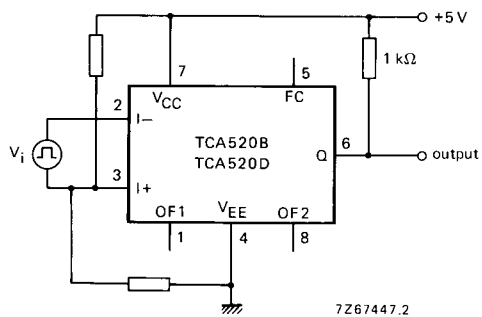


Fig. 11 Typical application of the TCA520 as a comparator; $|V_{2-3}|$ maximum 2 V.

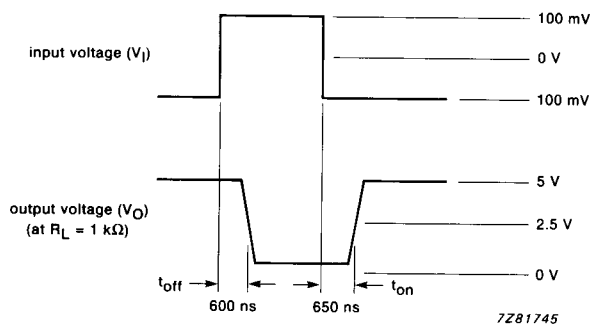


Fig. 12 Typical propagation delay time.