

OPERATIONAL AMPLIFIER

The TCA680 is a silicon monolithic integrated operational amplifier intended for general purposes, having a considerably improved slew rate and bandwidth compared to the TBA221 (μ A741C).

Special features are:

- internal frequency compensation;
- output short-circuit protection;
- pin compatible with general purpose operational amplifiers;
- offset voltage adjustable to zero.

QUICK REFERENCE DATA

Slew rate	S	typ.	20	V/ μ s
Unity gain frequency	f	typ.	6	MHz
Input bias current	I_i	typ.	30	nA
Voltage gain	G_v	typ.	100 000	
Supply voltage range	$V_P; -V_N$		3 to 15	V

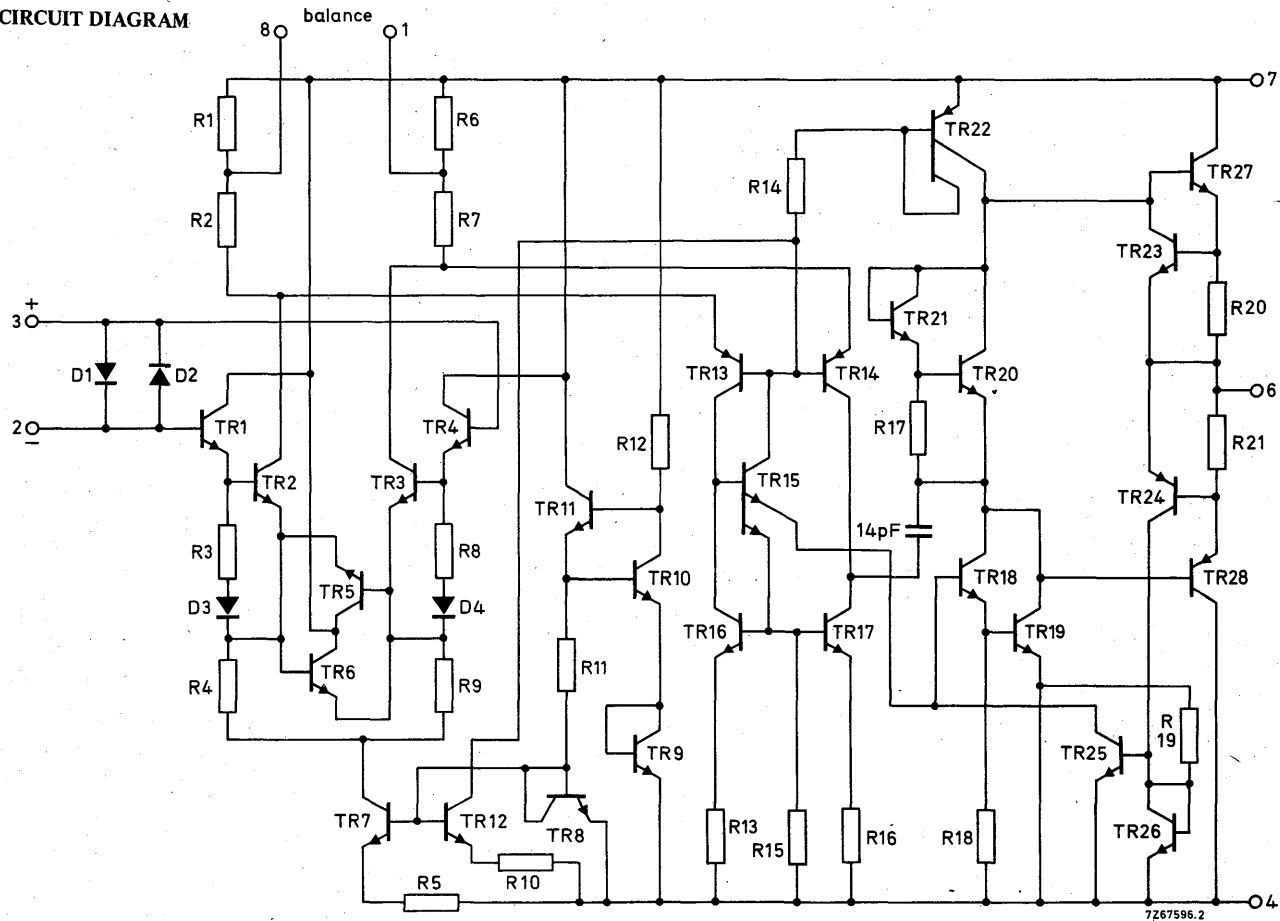
PACKAGE OUTLINES (see general section)

TCA680 : TO-99 (8-lead metal envelope).

TCA680B : SOT-97 (plastic 8-lead dual in-line).

TCA680D : SOT-96A (plastic 8-lead flat pack).

CIRCUIT DIAGRAM



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

Voltages

Positive supply voltage	V_P	max.	18	V
Negative supply voltage	$-V_N$	max.	18	V
Common mode input voltage (pins 2 and 3)		V_P to $-V_N$		
Differential input voltage	V_{2-3}	max.	$\pm 0,5$	V ¹⁾

Current

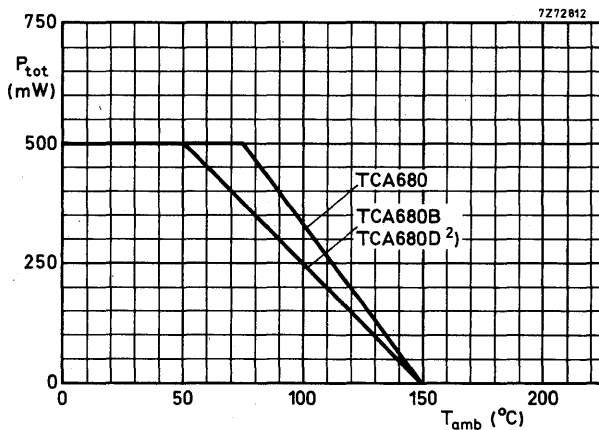
Input current	$I_2; I_3$	max.	± 10	mA ¹⁾
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Temperatures

Operating ambient temperature	T_{amb}	-25 to +85	°C
Storage temperature; metal envelope	T_{stg}	-65 to +150	°C
plastic envelope	T_{stg}	-65 to +125	°C

Power dissipation

Total power dissipation (see derating graph)	P_{tot}	max.	500	mW
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¹⁾ Diodes protect the inputs against over-voltage. Therefore, unless current-limiting resistors are used, large currents will flow if the differential input voltage exceeds 0,6 V.

²⁾ TCA680D mounted on a ceramic substrate of 5 cm². When mounted on a PC-board the maximum power dissipation is 330 mW.

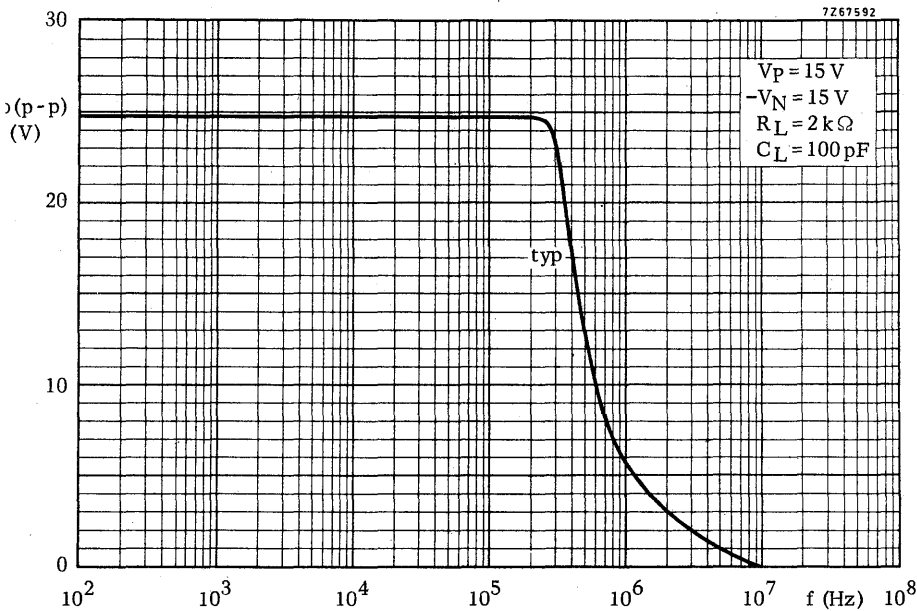
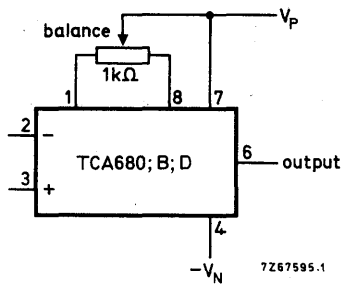
CHARACTERISTICS at $V_P = 15\text{ V}$; $-V_N = 15\text{ V}$; $T_{\text{amb}} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified

Input offset voltage	V_{io}	typ. <	2 8	mV mV
Input offset voltage drift	ΔV_{io}	typ.	25	mV
Input offset current	I_{io}	typ. <	5 30	nA nA
Input bias current	I_i	typ. <	30 100	nA nA
Input voltage range	V_i	> typ.	-12,5 to +13,5 -13,5 to +14,5	V V
Common mode rejection ratio	CMRR	> typ.	70 100	dB dB
Power supply voltage rejection ratio	PSRR	typ. <	10 100	$\mu\text{V}/\text{V}$ $\mu\text{V}/\text{V}$
Large signal voltage gain $\pm V_o = 10\text{ V}$; $R_L = 1\text{ k}\Omega$	G_v	> typ.	30 000 100 000	
Output voltage swing at $R_L = 1\text{ k}\Omega$	V_o	> typ.	± 12 ± 13	V V
Output resistance at $f = 1\text{ kHz}$	R_o	typ. <	50 100	Ω Ω
Output short-circuit current	I_{sc}	typ.	22	mA
Supply current	$I_{P;N}$	typ. <	4 6	mA mA
Transient response (voltage follower)				
$V_i = 500\text{ mV}$; $R_S = 10\text{ k}\Omega$; $R_L = 1\text{ k}\Omega$				
$C_L = 100\text{ pF}$				
rise time		typ.	50	ns
overshoot		typ.	20	%
Settling time at $V_i = 10\text{ V}$; 0,1% error		typ.	750	ns
Slew rate at $R_L = 1\text{ k}\Omega$; $C_L = 100\text{ pF}$	S	> typ.	15 20	$\text{V}/\mu\text{s}$ $\text{V}/\mu\text{s}$
A.C. gain at $f = 1\text{ kHz}$	G_v	typ.	6000 3800 to 8200	
Unity gain frequency	f	typ.	6	MHz
Power bandwidth (gain: -1)				
$V_{O(p-p)} = 20\text{ V}$; $R_L = 1\text{ k}\Omega$; $C_L = 100\text{ pF}$	B	typ.	320	kHz

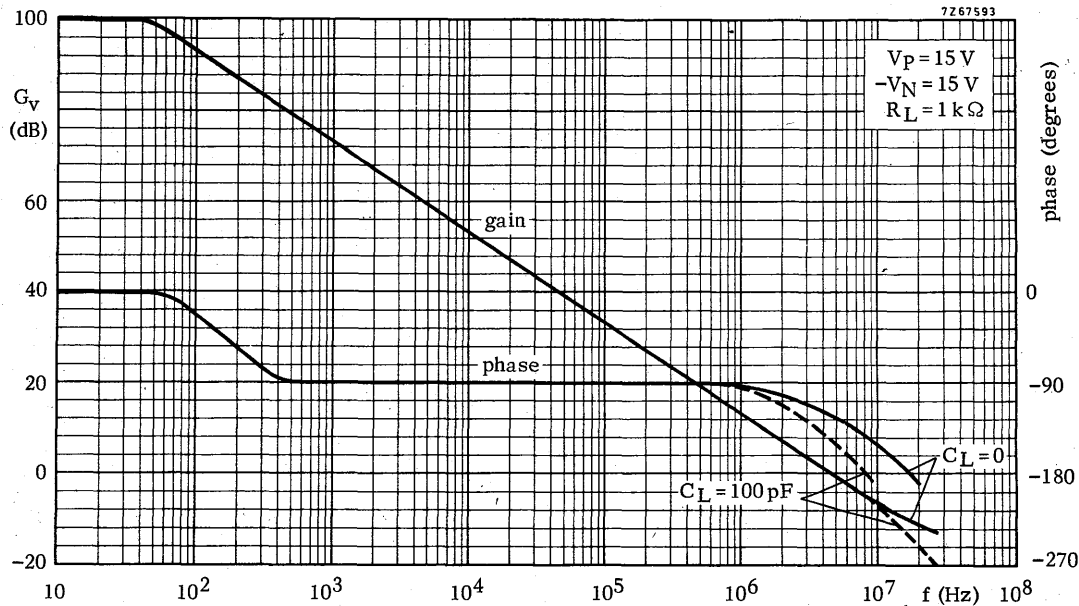
CHARACTERISTICS (continued)

Input noise voltage at f = 1 kHz	V_n	typ.	25	$\text{nV}/\sqrt{\text{Hz}}$
at f = 80 Hz	V_n	typ.	35	$\text{nV}/\sqrt{\text{Hz}}$
Input noise current at f = 1 kHz	I_n	typ.	2	$\text{pA}/\sqrt{\text{Hz}}$
at f = 80 Hz	I_n	typ.	4	$\text{pA}/\sqrt{\text{Hz}}$

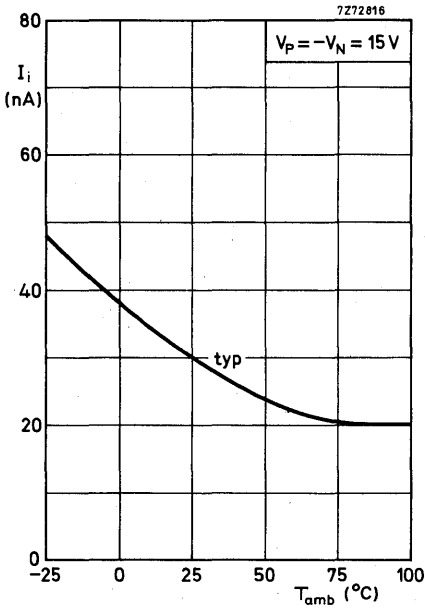
Offset voltage adjustment circuit:



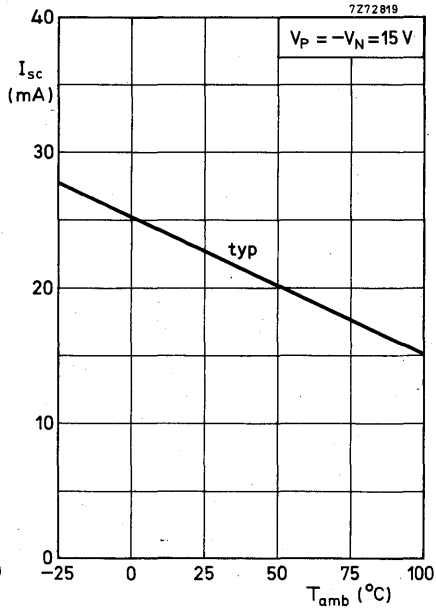
Output voltage swing versus frequency.



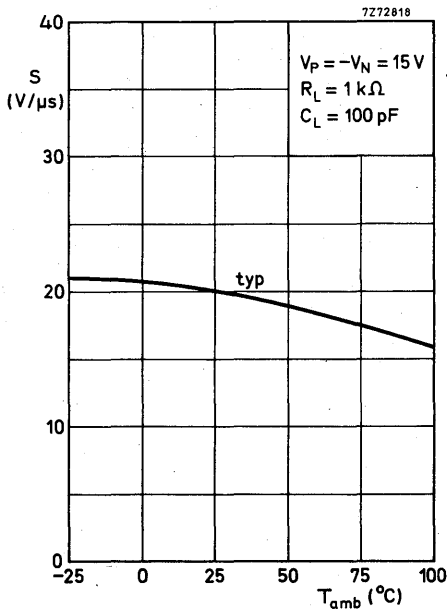
Open-loop voltage gain and phase response versus frequency



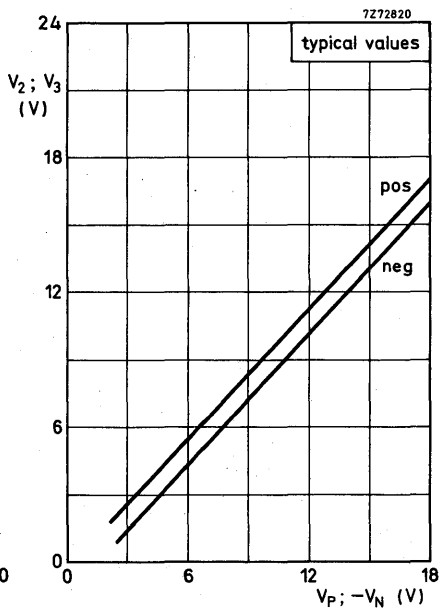
Input bias current.



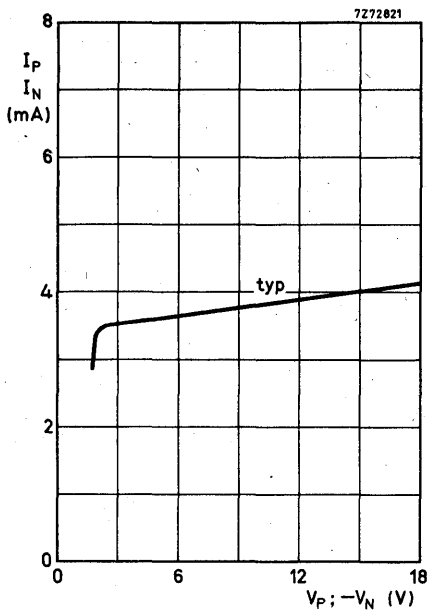
Output short-circuit current.



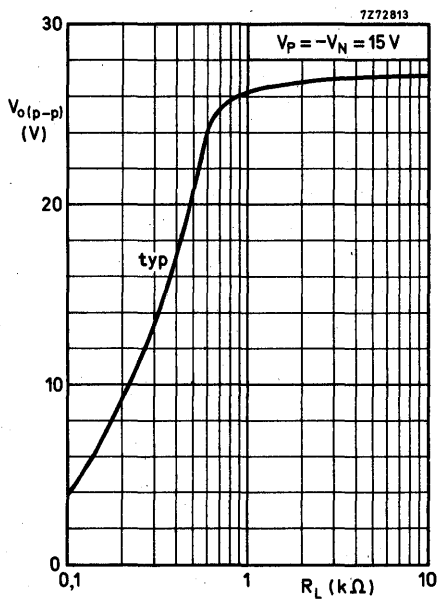
Slew rate.



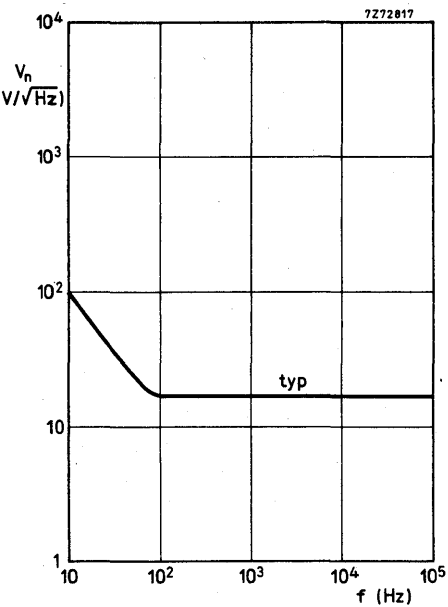
Input common mode voltage range.



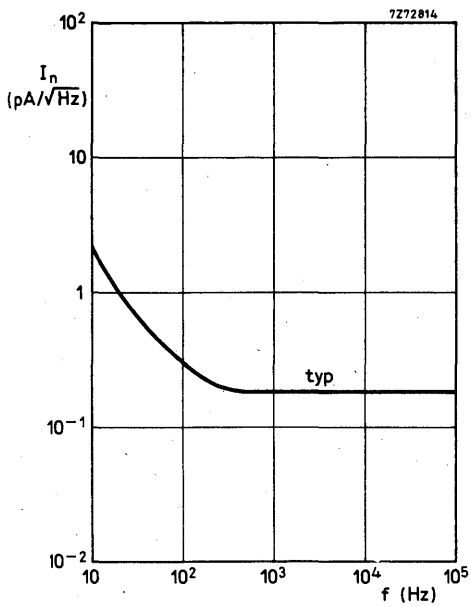
Supply current.



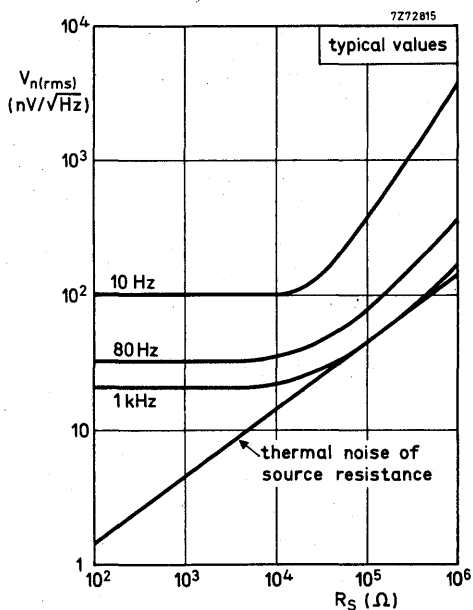
Output voltage swing.



Input noise voltage density.

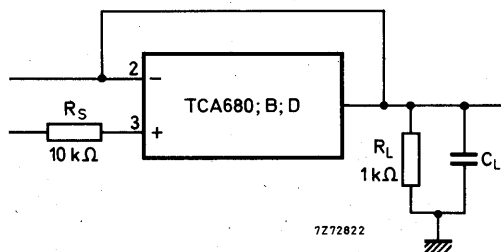
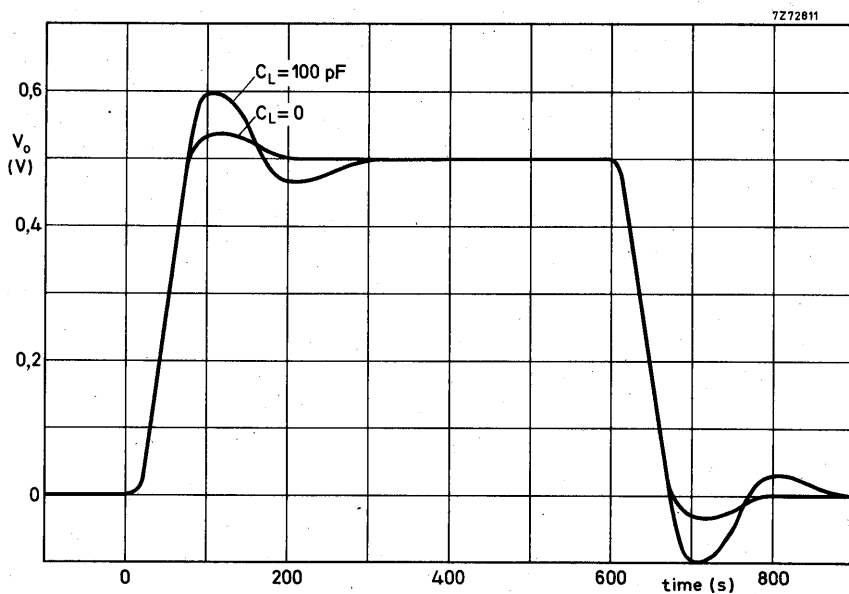


Input noise current density.



Total input noise voltage density.

TCA680; TCA680B
TCA680D



Transient response curves and test circuit.