VOLTAGE FOLLOWER

The TCA410 is a silicon monolithic integrated operational amplifier internally connected as a voltage follower.
Special features are:

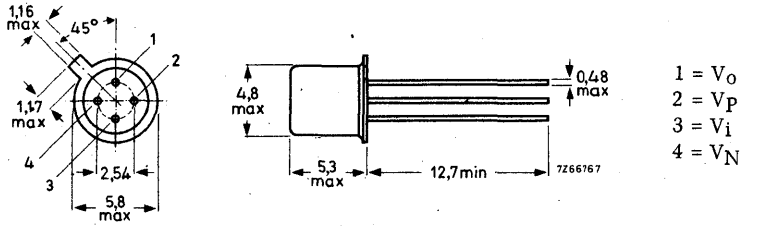
- very low input current;
- continuous short-circuit protection;
- no frequency compensation required
- small package (TO-72 or SOT-95A)

For most applications the TCA410 can be used as a direct replacement for the LM302 and LM310. The TCA410D is pin to pin compatible with the TBA221D, when the latter is connected as a voltage follower.

QUICK REFERENCE DATA				
Supply voltage range	$V_P = -V_N$		5 to 18	V
		TCA410A TCA410D	TCA410B	
Input bias current	I_i	typ. 0,5	1,5	nA
Input offset voltage	V_{io}	typ.	3	mV
Output short-circuit current	I_{sc}	typ.	10	mA
Output voltage swing at R_L = 5 kΩ	V_o	typ.	13,5	V
Slew rate	S	typ.	4	V/μs

PACKAGE OUTLINE (for TCA410D see page 2) Dimensions in mm

TCA410A; TCA410B: TO-72

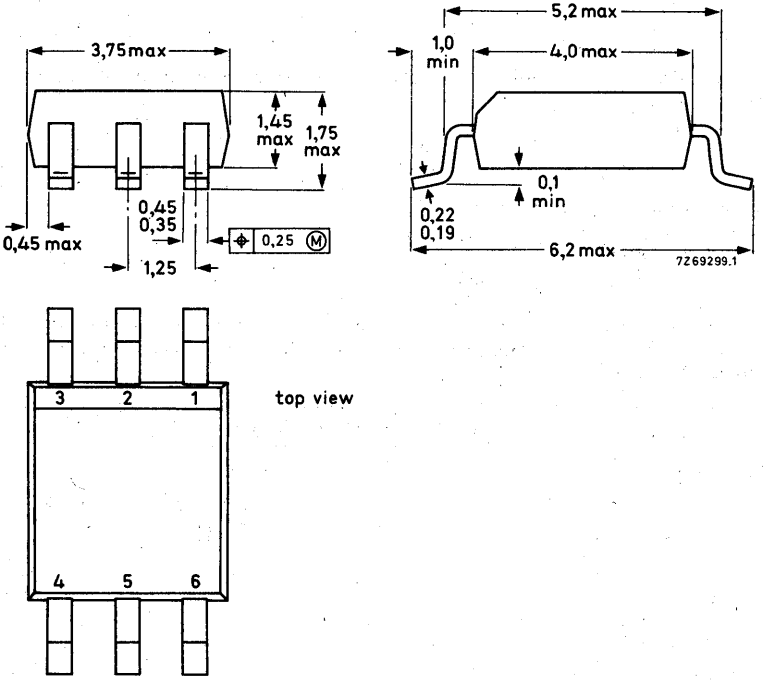


1 = V_o
2 = V_P
3 = V_i
4 = V_N

pin 4 connected to case

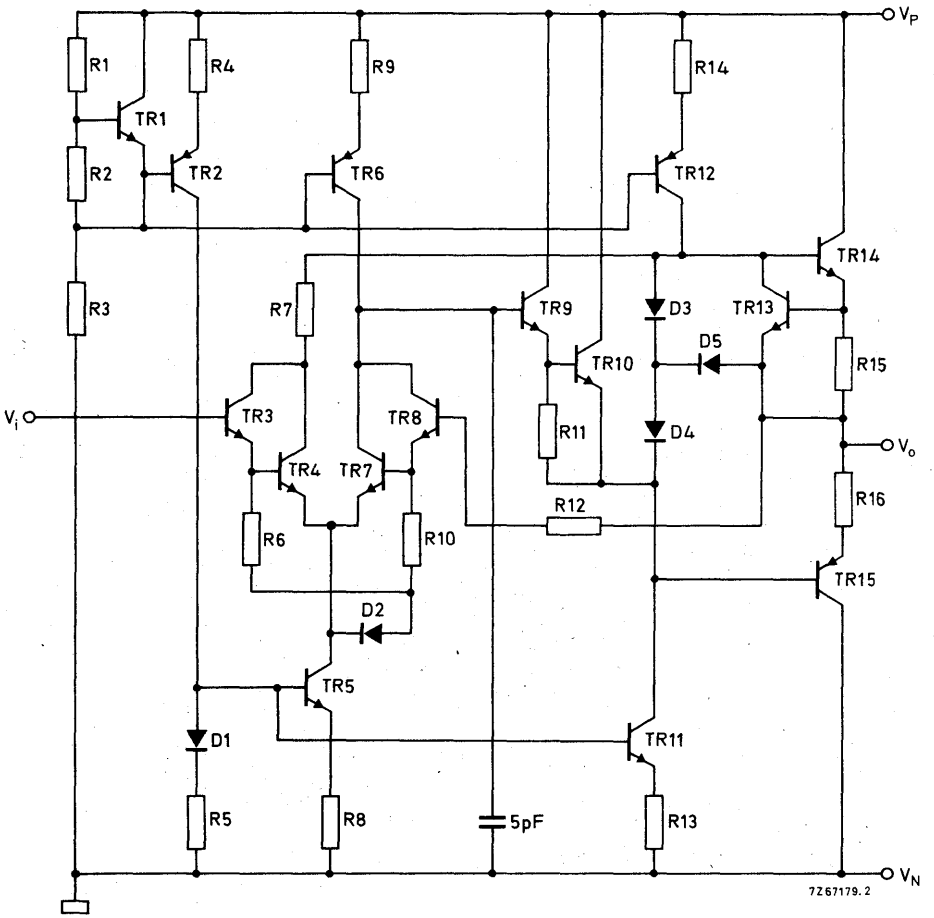
PACKAGE OUTLINE (continued) Dimensions in mm

TCA410D; SOT-95A (plastic 6-lead flat pack)



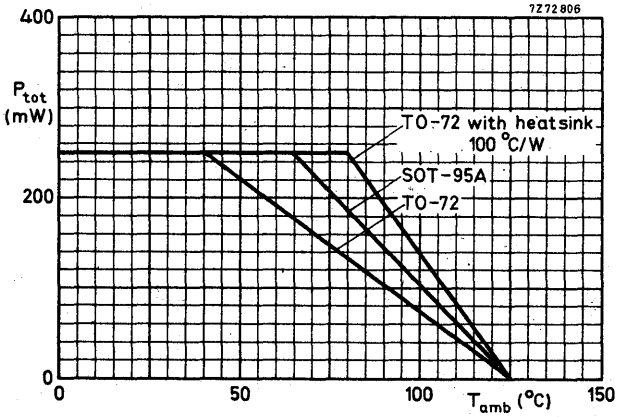
1. Not connected
2. Input (V_i)
3. Negative supply (V_N)
4. Not connected
5. Output (V_o)
6. Positive supply (V_P)

CIRCUIT DIAGRAM



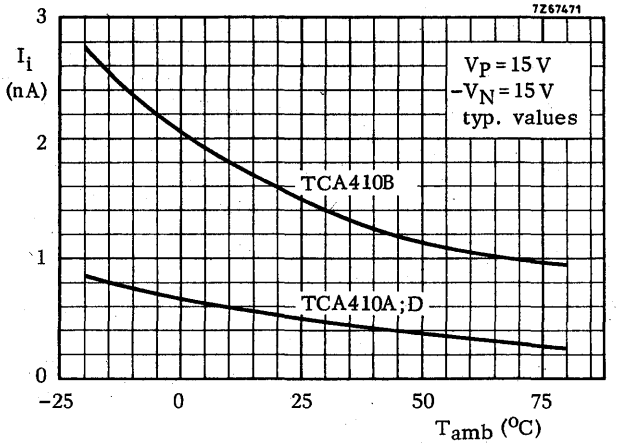
RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

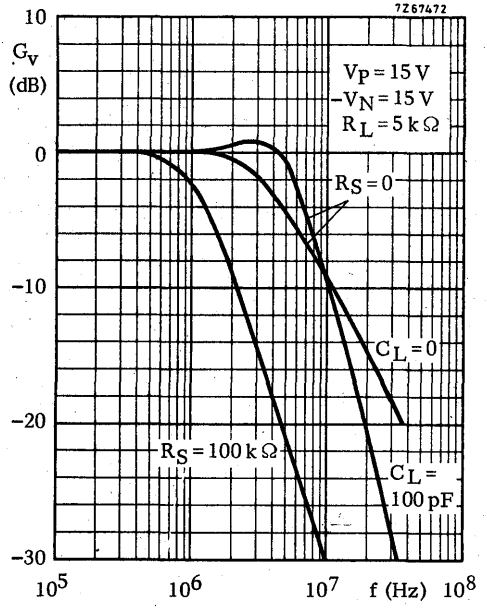
Voltages				
Positive supply voltage	V_P	max.	18	V
Negative supply voltage	$-V_N$	max.	18	V
Common mode input voltage		V_N to V_P		
Differential input/output voltage		max.	±6	V
Power dissipation (see derating curve)	P_{tot}	max.	250	mW
Temperatures				
Operating ambient temperature	T_{amb}	−25 to	+85	°C
Storage temperature				
metal envelope; TO-72	T_{stg}	−65 to	+125	°C
plastic flat pack; SOT-95A	T_{stg}	−65 to	+125	°C

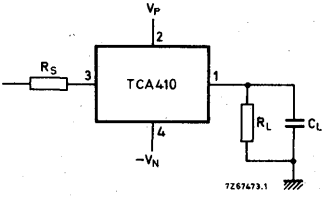


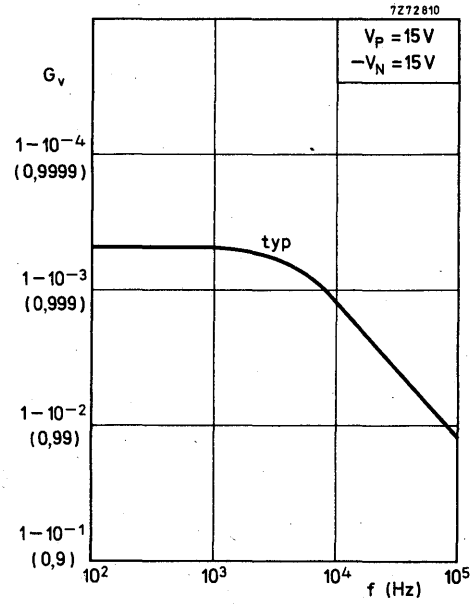
CHARACTERISTICS at V_P = 15 V; $-V_N$ = 15 V; T_{amb} = 25 °C

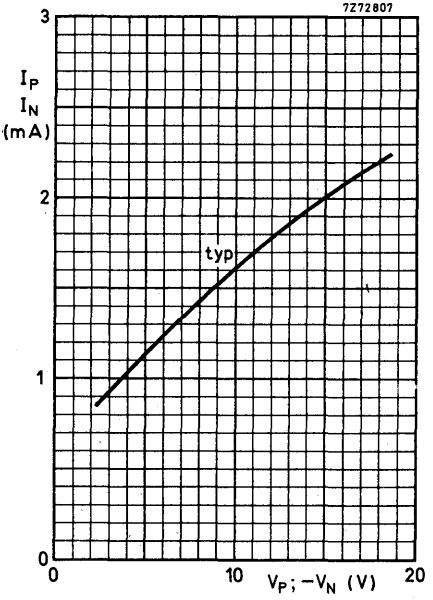
			TCA410A	B	D	
Input bias current	I_i	typ.	0,5	1,5	0,5	nA
		<	1,0	3,0	3,0	nA
Input offset voltage	V_{io}	typ.			3	mV
		<			10	mV
Input offset voltage drift	ΔV_{io}	typ.			20	μV/°C
Voltage gain at R_L = 5 kΩ; V_i = ±12,5 V	G_v	>			0,9980	
		typ.			0,9995	
Output voltage swing at R_L = 5 kΩ	V_o	>			±12,5	V
		typ.			±13,5	V
Output resistance at I_o = ±6 mA	R_o	typ.			0,7	Ω
		<			2,0	Ω
Output short-circuit current	I_{sc}	typ.			10	mA
					6 to 14	mA
Slew rate	S	>			2,5	V/μs
		typ.			4,0	V/μs
Supply current	$I_{P;\,N}$	typ.			2	mA
		<			3	mA
Power supply voltage rejection ratio	PSRR	>			65	dB
		typ.			75	dB
Supply voltage range	$V_P = -V_N$				5 to 18	V
Input capacitance	C_i	typ.			2,5	pF
Input noise voltage at f = 1 kHz	V_n	typ.			80	$nV/\sqrt{Hz}$
at f = 10 Hz	V_n	typ.			200	$nV/\sqrt{Hz}$
Input noise current at f = 1 kHz; TCA410A	I_n	typ.			0,006	$pA/\sqrt{Hz}$
TCA410B	I_n	typ.			0,015	$pA/\sqrt{Hz}$
at f = 10 Hz : TCA410A	I_n	typ.			0,04	$pA/\sqrt{Hz}$
TCA410B	I_n	typ.			0,1	$pA/\sqrt{Hz}$

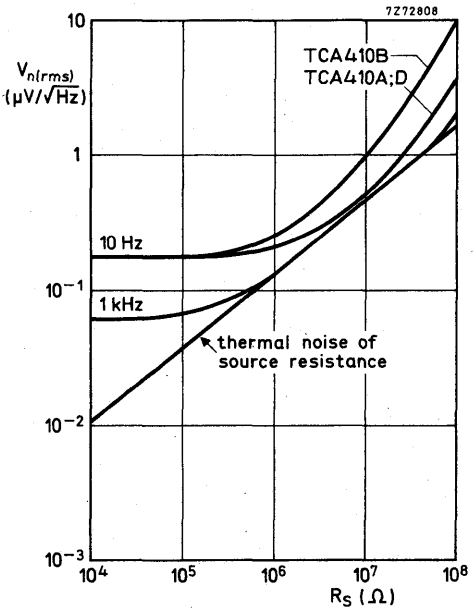

7Z67471
3
2
1
0
I_i
(nA)
V_P = 15 V
$-V_N$ = 15 V
typ. values
TCA410B
TCA410A;D
−25
0
25
50
75
T_{amb} (°C)

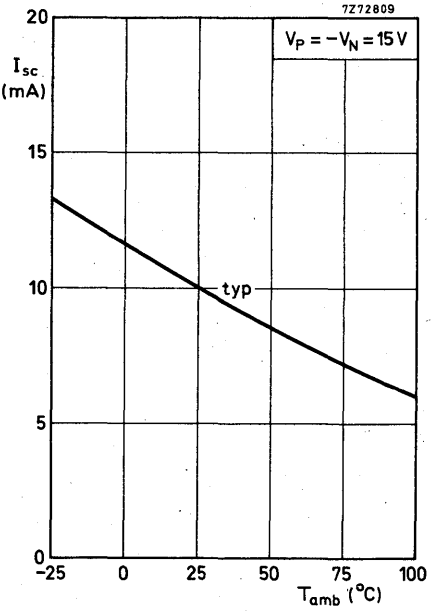

7Z67472
10
0
−10
−20
−30
G_v
(dB)
V_P = 15 V
$-V_N$ = 15 V
R_L = 5 kΩ
R_S = 0
C_L = 0
R_S = 100 kΩ
C_L = 100 pF
10^5
10^6
10^7
f (Hz)
10^8


V_P
2
R_S
3
TCA410
1
R_L
C_L
4
$-V_N$
7Z67473.1


7Z72810
$V_P = 15\,V$
$-V_N = 15\,V$
G_v
$1-10^{-4}$
(0,9999)
$1-10^{-3}$
(0,999)
$1-10^{-2}$
(0,99)
$1-10^{-1}$
(0,9)
typ
10^2
10^3
10^4
10^5
f (Hz)


7Z72807
I_P
I_N
(mA)
3
2
1
0
typ
0
10
20
$V_P; -V_N$ (V)


7Z72808
10
$V_{n(rms)}$
(μV/√Hz)
1
10^{-1}
10^{-2}
10^{-3}
TCA410B
TCA410A;D
10 Hz
1 kHz
thermal noise of
source resistance
10^4
10^5
10^6
10^7
10^8
R_S (Ω)


7Z72809
$V_P = -V_N = 15\,V$
I_{sc}
(mA)
20
15
10
5
0
typ
−25
0
25
50
75
100
T_{amb} (°C)