Operational Amplifier

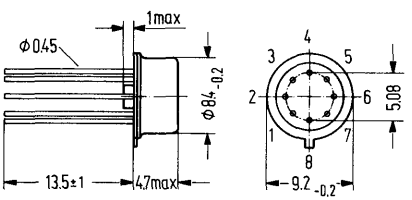
TBB 0748 -748
TBB 0748 B-748
TBC 0748 -748

TBB 0748 and TBC 0748 are monolithic integrated operational amplifiers in packages similar to 5 G 8 DIN 41873 (TO-99). They are outstanding by their large common-mode voltage range, high differential input voltage range and permanently short-circuit proof. In addition, they feature an adjustable input offset-voltage and have the same pin configuration as the popular TBA 221 operational amplifier. Unity gain frequency compensation is achieved by means of a single 30 pF capacitor. TBB 0748 B (8 pins) in plastic plug-in package.

Type	Ordering codes
TBB 0748:	Q67000-A1041
TBB 0748 B:	Q67000-A1042
TBC 0748:	Q67000-A1073

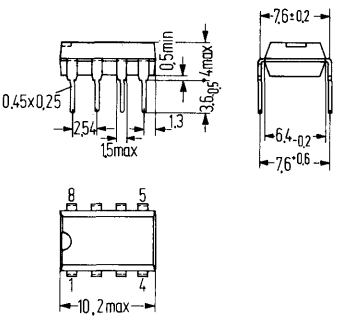
Package outlines

TBB 0748, TBC 0748



Case similar 5 G 8 DIN 41873 (TO-99)
Weight approx. 1.2 g

TBB 0748 B



Plastic plug-in package, 8 pins
20 A 8 DIN 41866
Weight approx. .7 g

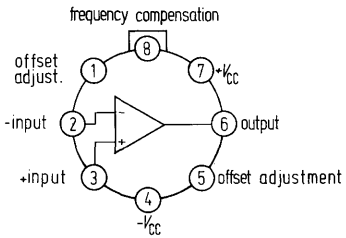
Dimensions in mm

Maximum ratings		TBB 0748 TBB 0748 B	TBC 0748	
Supply voltage	V_{CC}	±18	±22	V
Input voltage[1])	V_I	±15	±15	V
Differential input voltage	V_{ID}	±30	±30	V
Short circuit duration[2])	t_{SC}	∞	∞	
Storage temperature	T_S	−65 to +150	−65 to +150	°C
Junction temperature	Tj	150	150	°C
Thermal resistance:				
System-case (TBB 0748/TBC 0748)	$R_{thScase}$	80	80	K/W
System-ambient air (TBB 0748, TBC 0748)	R_{thSamb}	190	190	K/W
System-ambient air (TBB 0748 B)	R_{thSamb}	110		K/W
Range of operation				
Supply voltage	V_{CC}	±4 to ±18	±4 to ±22	V
Ambient temperature in operation	T_{amb}	0 to +70	−55 to +125	°C

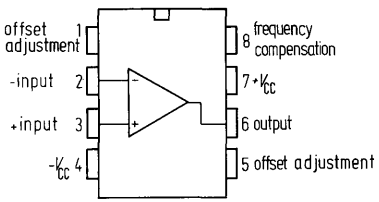
[1]) For supply voltage less than ± 15 V the maximum input voltage is equal to the supply voltage
[2]) Short circuit may be ground or ± V_{CC}.

Pin connection

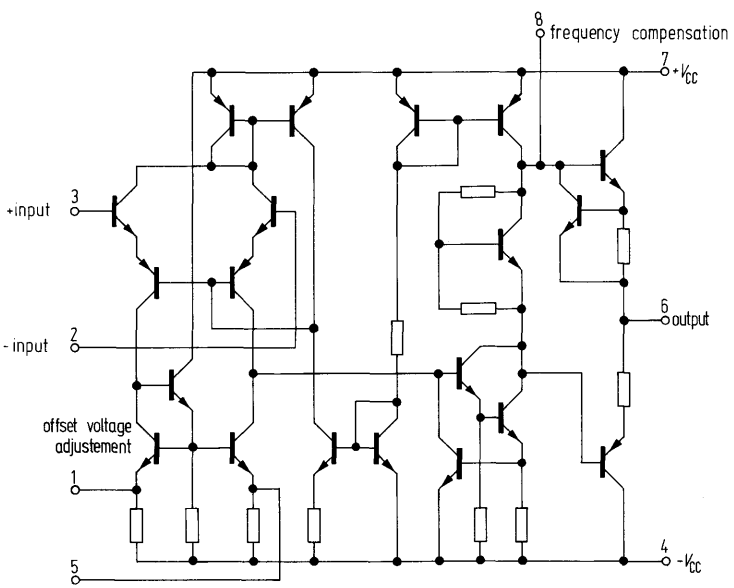
TBB 0748
TBC 0748



TBB 0748 B



Circuit diagram

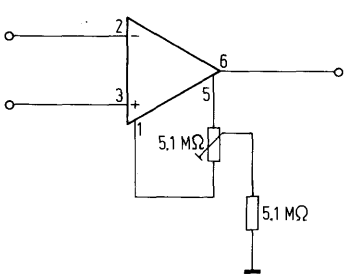


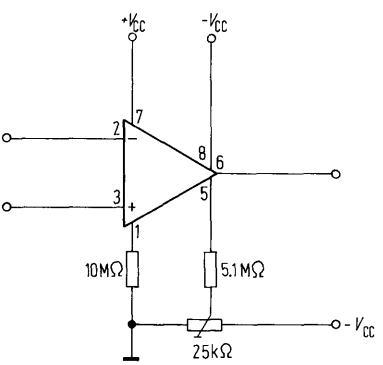
With TBB and TBC 0748 pin 4 is electrically connected to case.

Operating characteristics
($V_{CC} = \pm 15$V, $T_{amb} = 25$°C, $C = 30$ pF when not otherwise stated)

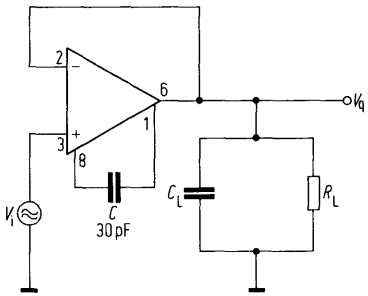
		TBB 0748/B			TBC 0748			
		min	typ	max	min	typ	max	
Input offset voltage ($R_G \leq 10$ kΩ)	V_{io}	−6		6	−4		4	mV
(T_{amb} = 0 to 70°C)	V_{io}	−7.5		7.5				mV
(T_{amb} = −55 to +125°C)	V_{io}				−6		6	mV
Adjustable range of input offset voltage	ΔV_{io}	6	±15	−6	6	±15	−6	mV
Input offset current	I_{io}	−200	±20	200	−100	±20	100	nA
(T_{amb} = 0 to 70°C)	I_{io}	−300		300				nA
(T_{amb} = −55 to +125°C)	I_{io}				−500		500	nA
Input current	I_i		80	500		80	350	nA
(T_{amb} = 0 to 70°C)	I_i			800				nA
(T_{amb} = −55 to +125°C)	I_i					.3	1.5	μA
Current supply	I_{CC}		1.7	2.8		1.7	2.8	mA
Output short circuit current	I_{qsc}		±18			±18		mA
Input resistance	R_i	300	2000		300	2000		kΩ
Input capacitance	C_i		2			2		pf
Output resistance	R_q		75			75		Ω
Output voltage ($R_L \geq 10$ kΩ)	V_{qpp}	12	±14	−12	13	±14	−12.5	V
($R_L \geq 2$ kΩ)	V_{qpp}	10	±13	−10	11	±13	−11	V
Common mode input voltage range	V_{iCM}	12	±13	−12	12	±13	−12	V
Voltage gain ($V_{qpp} = \pm 10$ V, $R_L \geq 2$ kΩ)	G_V	86	100		94	103		dB
T_{amb} = 0 to 70°C	G_V	83						dB
T_{amb} = −55 to +125°C	G_V				88			dB
Common-mode rejection ratio (R_G = 10 kΩ)	$CMRR$	70	90		80	90		dB
Sensitivity to supply voltage variations (R_G = 10 kΩ)	$\frac{\Delta V_{io}}{\Delta V_{CC}}$		30	150		30	100	μV/V
Transient behaviour of the output voltage at $G_V = 1$ ($V_i = 20$ mV, $R_L = 2$ kΩ, $C_L < 100$ pF)								
Rise time	t_r		.3			.3		μs
Overshoot			5			5		%
Leading edge slope ($R_L \geq 2$ kΩ)	$\frac{dV_{qpp}}{dt}$		5.5			5.5		V/μs
Temperature coefficient of V_{io}	α_{Vio}					3		μV/K
Temperature coefficient of I_{io}	α_{Iio}					.4		nA/K

Adjustement of offset voltage.

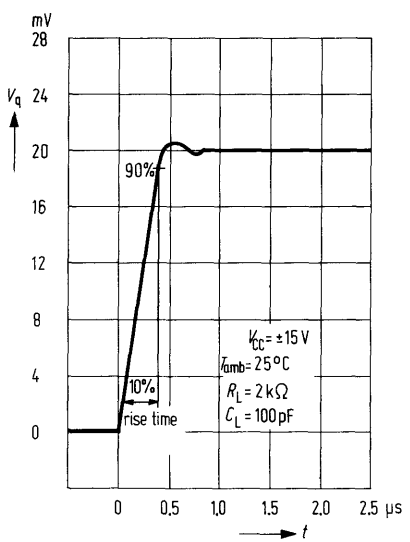




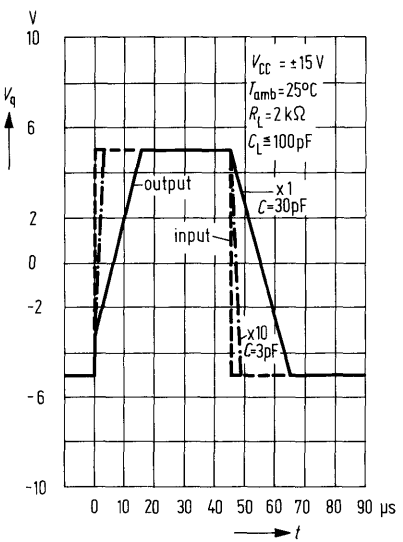
Test circuit: Transient response



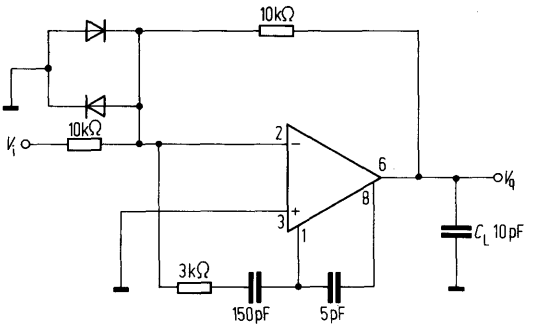
Transient response of the output voltage
$V_q = f(t)$; $G_V = 1$



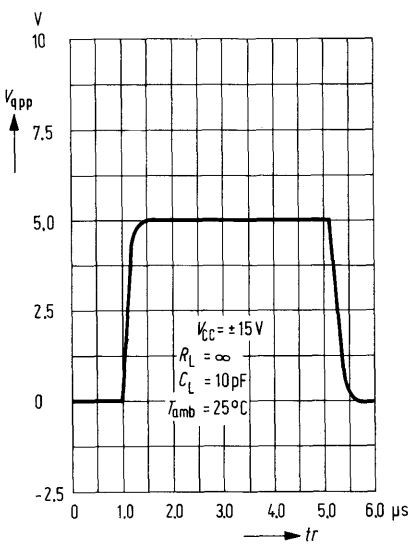
Large signal pulse response
$V_q = f(t)$



Feed-forward compensation

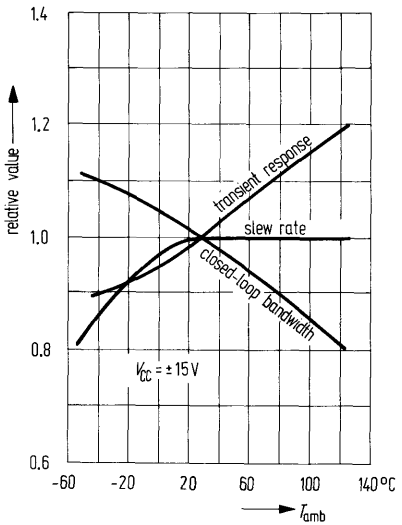


Large signal feed-forward transient response

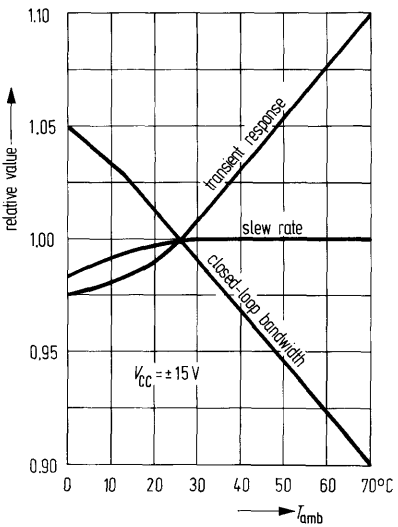


Performance curves for TBB 0748/B and TBC 0748

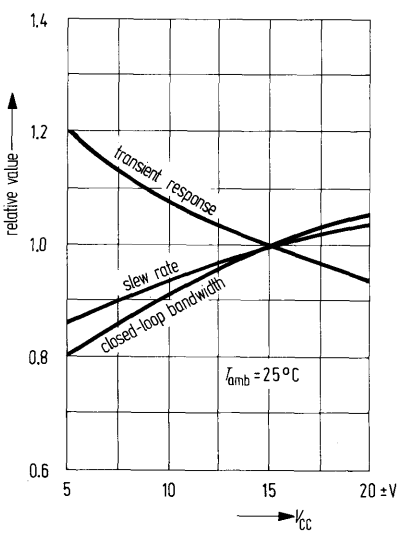
TBC 0748 Frequency characteristics as a function of ambient temperature



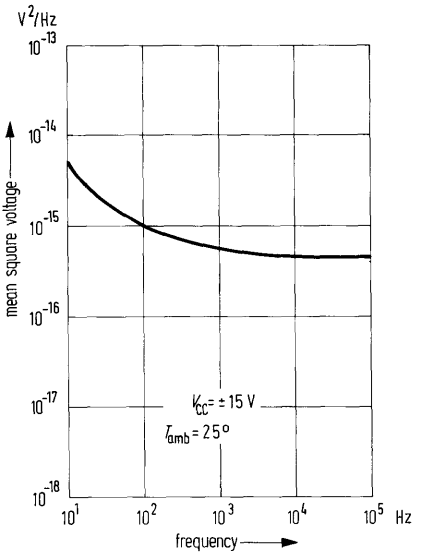
TBB 0748 B Frequency characteristics as a function of ambient temperature



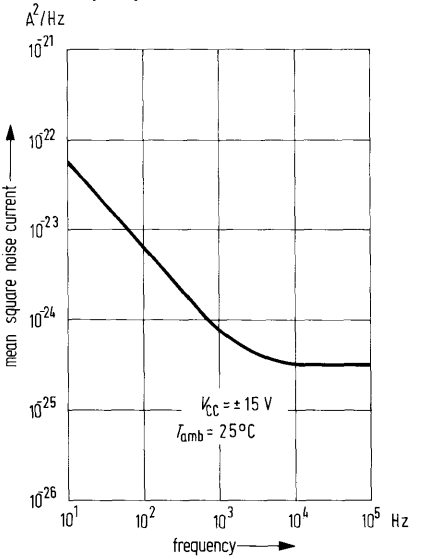
Frequency characteristics as a function of supply voltage



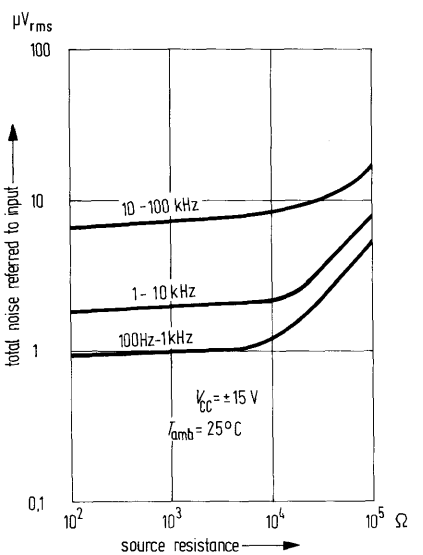
Input noise voltage as a function of frequency



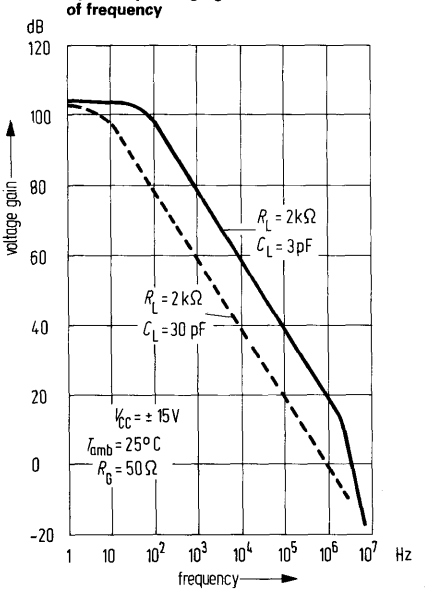
Input noise current as a function of frequency



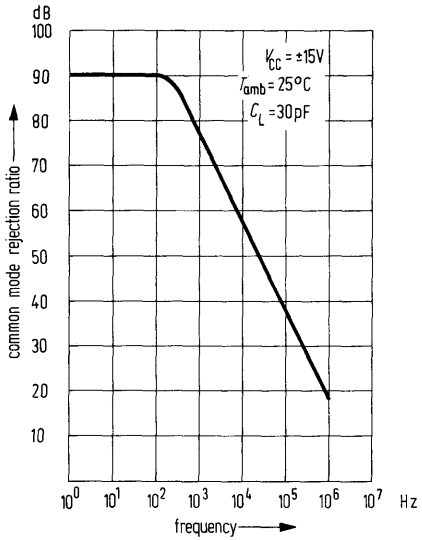
Broadband noise for various bandwidths



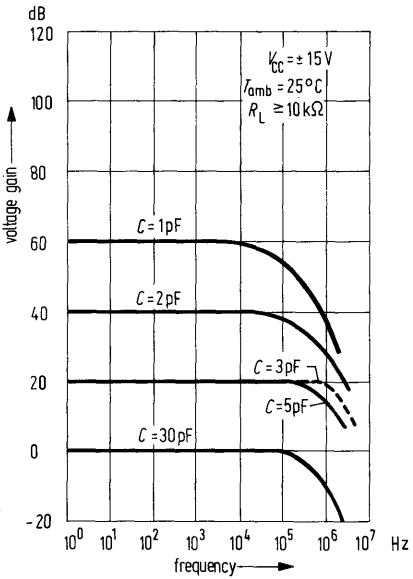
Open loop voltage gain as a function of frequency



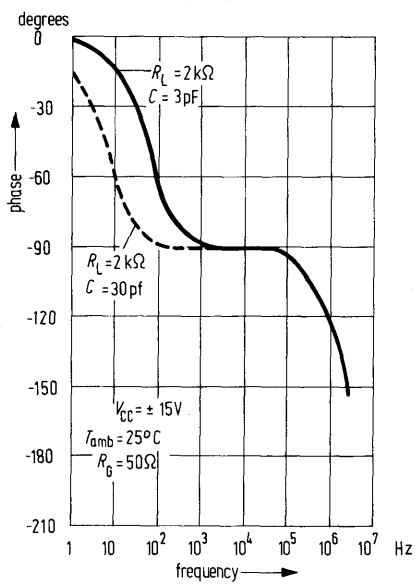
Common mode rejection ratio as a function of frequency



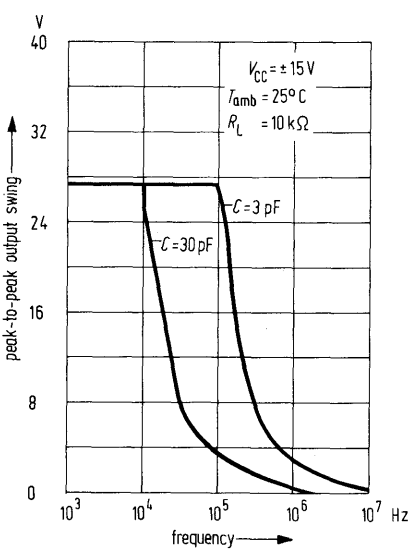
Frequency response for various closed loop gains



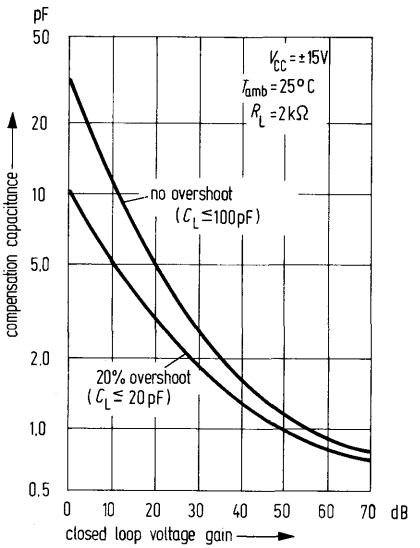
Open loop phase response as a function of frequency



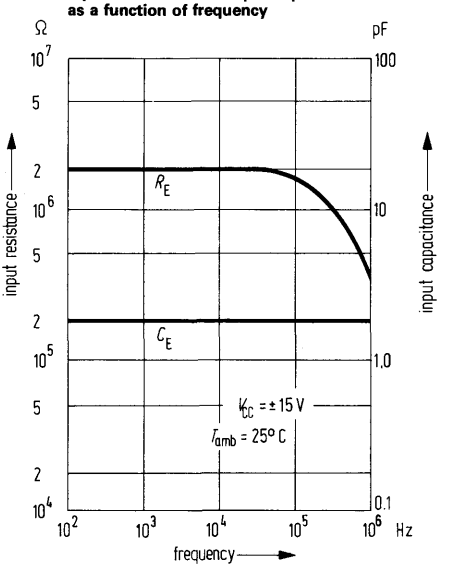
Output voltage swing as a function of frequency



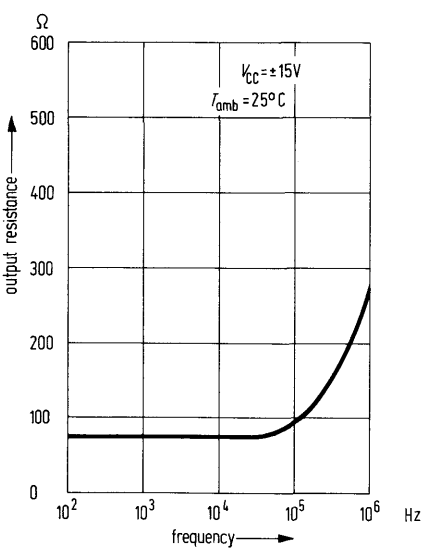
Compensation capacitance as a function of closed loop voltage gain



Input resistance and input capacitance as a function of frequency



Output resistance as a function of frequency



Further performance curves see data sheet TBA 221