Operational Amplifier with Darlington Input

TCA 331; A; W
TCA 332
TCA 335; A; W

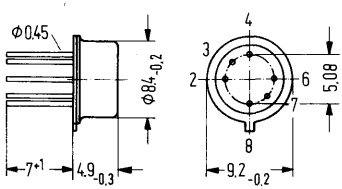
An economical and universal operational amplivier which by its excellent performance qualities is well suited for a wide range of applications such as measurement- and servo-systems, automobile electronics, AF-circuits, analog computers etc. The low input current of this amplifier is particulary advantageous in measurement- and servo system applications. In addition to a high gain, low offset voltage, small temperature- and supply voltage-dependence, the amplifier features

- High input resistance
- Wide common-mode range
- Large supply voltage range
- Large control range
- High output current
- Simple frequency compensation

Type	Ordering code
TCA 331	Q67000-A1013
TCA 331 A	Q67000-A1014
TCA 331 W	Q67000-A1015
TCA 332	Q67000-A1016
TCA 335	Q67000-A1017
TCA 335 A	Q67000-A563
TCA 335 W	Q67000-A1018

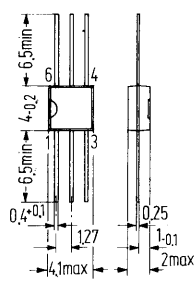
Package outlines

TCA 331, TCA 332, TCA 335



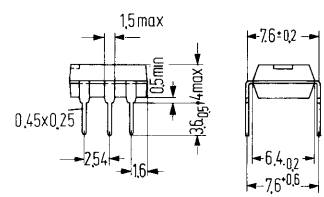
Package 5 H 6 DIN 41873
(similar TO-78)
Weight approx. 1 g

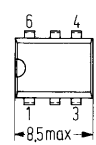
TCA 331 W, TCA 335 W



Miniature plastic
package
6 pins
Weight approx. .1 g
Colour code
TCA 331 W blue/white
TCA 335 W blue/yellow

TCA 331 A, TCA 335 A





Plastic plug-in package
6 pins
20 A 6 DIN 41866
Weight approx. .7 g

Dimensions in mm

Maximum ratings

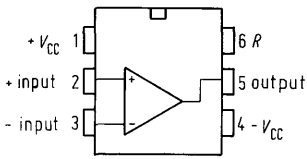
		TCA 331/A/W TCA 332 TCA 335/A/W	
Supply voltage	V_{CC}	±15	V
Output current	I_q	70	mA
Differential input voltage V_{CC} = ±13 to ±15 V	V_{iD}	±13	V
Differential input voltage V_{CC} = ±2 to ±13 V	V_{iD}	$\pm V_{CC}$	
Junction temperature	T_j	150	°C
Storage temperature	T_s	–55 to +150	°C
Thermal resistance:			
System-case (TCA 331, 332, 335)	$R_{thScase}$	80	K/W
System-ambient air (TCA 331, 332, 335)	R_{thSamb}	190	K/W
System-ambient air (TCA 331 A, TCA 335 A)	R_{thSamb}	140	K/W
System-ambient air (TCA 331 W, TCA 335 W)	R_{thSamb}	200	K/W

Range of operation

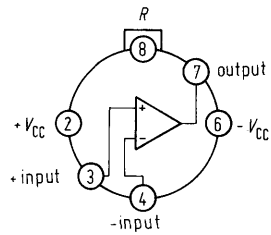
Supply voltage	V_{CC}	±2 to ±15	V
Ambient temperature in operation			
TCA 331/A/W	T_{amb}	0 to +70	°C
TCA 335/A/W	T_{amb}	–25 to +85	°C
TCA 332	T_{amb}	–55 to +125	°C

Pin connection

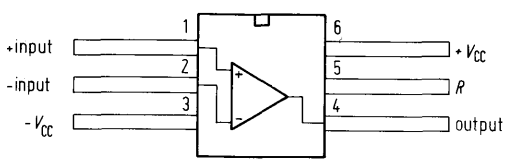
TCA 331 A
TCA 335 A



TCA 331
TCA 332
TCA 335



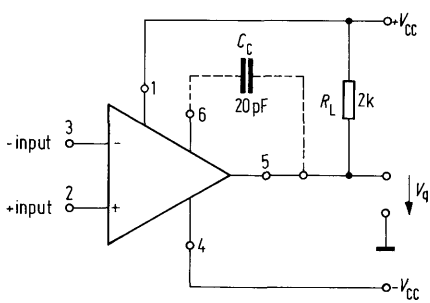
TCA 331 W
TCA 335 W



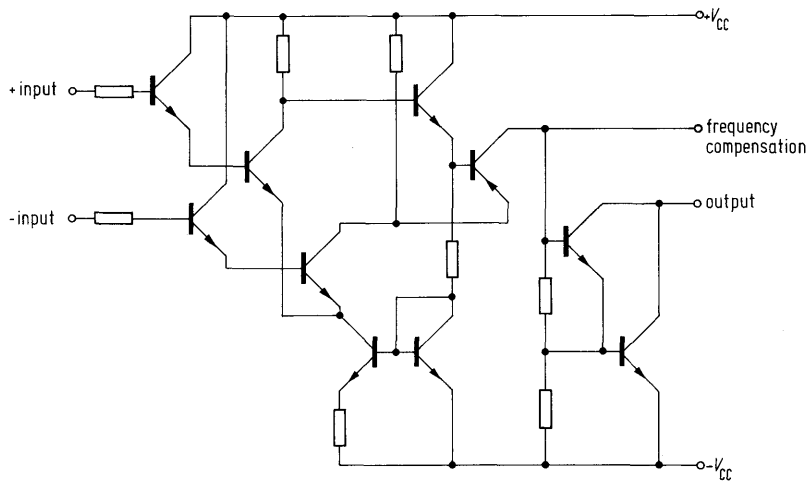
R = frequency compensation

Connection diagram

C_C = Output frequency compensation,
R_L = load resistance



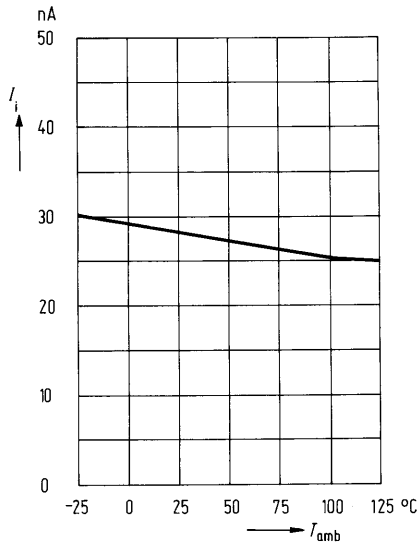
Circuit diagram



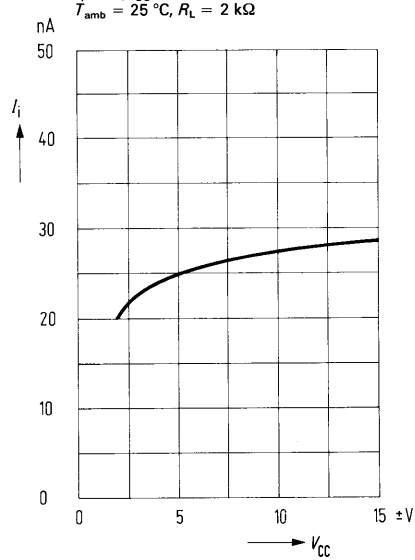
Operating characteristics (V_{CC} = ±15 V)		**TCA 331/A/W TCA 335/A/W** T_{amb} = 25 °C			**TCA 332** T_{amb} = 25 °C			**TCA 332** T_{amb} = −55 to 125 °C		
		min	typ	max	min	typ	max	min	max	
Supply current	I_{CC}		1.5	2.5		1.5	2.5			mA
Input offset voltage (R_G = 50 Ω)	V_{io}	−20		20	−14		14	−20	20	mV
Input offset current	I_{io}	−25	±10	25	−15		15	−40	40	nA
Input current	I_i		30	50			30		80	nA
Input current (V_{ID} = ±13 V)	I_i			200			200			nA
Output voltage										
(R_L = 2 kΩ)	V_{qpp}	14.9		−14.0	14.9		−14.0	14.8	−14.0	V
(R_L = 620 Ω)	V_{qpp}	14.9		−12.5	14.9		−12.5	14.8	−12.0	V
(R_L = 2 kΩ, f = 100 kHz)	V_{qpp}		±10			±10				V

Operating characteristics (continued) V_{CC} = ±15 V		**TCA 331/A/W TCA 335/A/W** T_{amb} = 25 °C			**TCA 332** T_{amb} = 25 °C			T_{amb} = −55 to +125 °C		
		min	typ	max	min	typ	max	min	max	
Input impedance (f = 1 kHz)	Z_i		3			3				MΩ
Open-loop voltage gain (R_L = 2 kΩ, f = 1 kHz)	G_V	75	80		80	83		75		dB
(R_L = 10 kΩ, f = 1 kHz)	G_V		85			88				dB
(R_L = 2 kΩ, f = 1 MHz)	G_V		43			43				dB
Input common-mode range (R_L = 2 kΩ)	V_{ICM}	13		−13	13		−13			V
Common-mode rejection ratio (R_L = 2 kΩ)	$CMRR$	60	74		65	77				dB
Sensitivity to supply voltage variations (C_C = 1 pf, G_V = 100)	$\frac{\Delta V_{io}}{\Delta V_{CC}}$		25	200		25	200			μV/V
Temp. coefficient of V_{io} (R_G = 50 Ω)	α_{Vio}		12			12	50			μV/K
Temp. coefficient of I_{io} (R_G = 50 Ω)	α_{Iio}		50			50				pA/K
Rise time of V_q for non-inverting operation (test circuit 1)	$\frac{dV_q}{dt_r}$		9			9				V/μs
Rise time for V_q for inverting operation (test circuit 2)	$\frac{dV_q}{dt_r}$		18			18				V/μs
Output saturation voltage (I_q = 10 mA)	V_{qsat}			1			1			V
Output leakage current V_{CC} = ±5 V	I_{qlk}		1	10		1	10			μA
Input offset voltage (R_G = 50 Ω)	V_{io}	−20		20	−14		14			mV
Input offset current	I_{io}	−25	±10	25	−15		15			nA
Input current	I_i		30	50			30			nA
Open loop voltage gain (R_L = 2 kΩ, f = 1 kHz)	G_V	65			70					dB

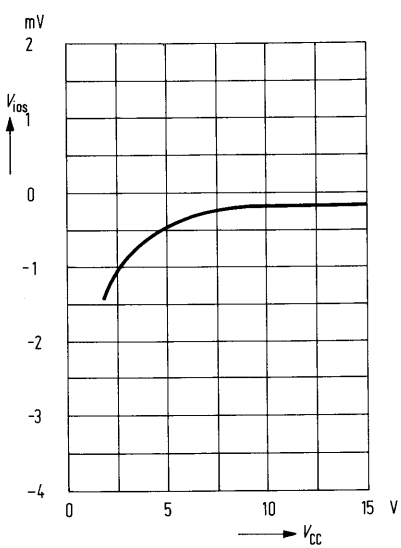
Input current
$I_i = f(T_{amb})$; R_L = 2 kΩ



Input current
$I_i = f(V_{CC})$
T_{amb} = 25 °C, R_L = 2 kΩ



Input offset voltage $V_{ios} = f(V_{CC})$



For further performance curves see TAA 761