

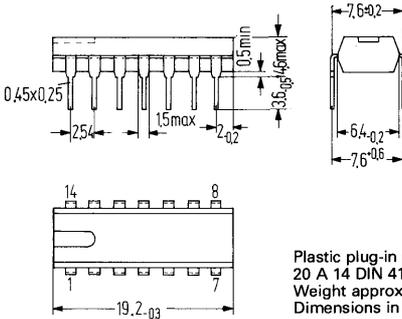
An economical and universal operational amplifier which by its excellent performance qualities is well suited for a wide range of applications such as measurement- and servo-systems, automobile electronics, AF-circuits, analog computers etc. The low input current of this amplifier is particularly advantageous 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

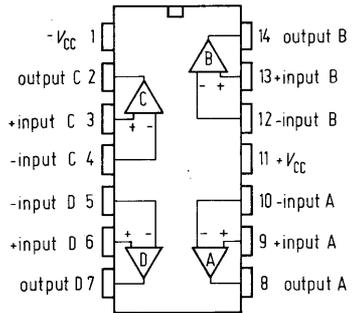
Type	Ordering codes
TBB 4331 A	Q67000-A1166
TBE 4335 A	Q67000-A1167

For single amplifier performance, see TCA 311 data sheet.

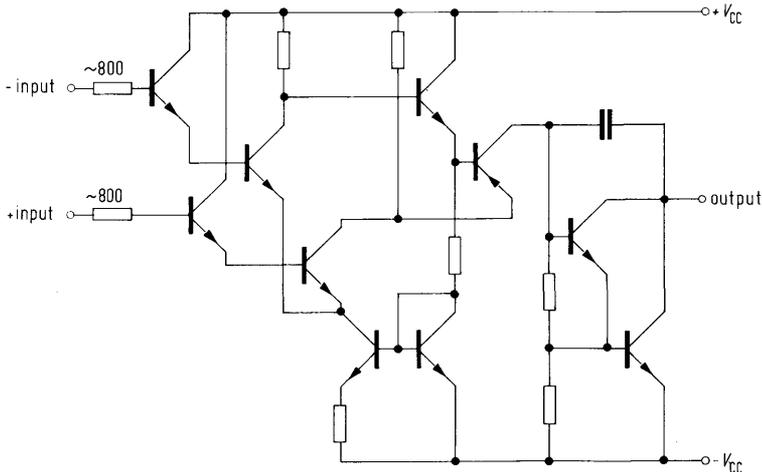
### Package outlines



### Pin connection



### Equivalent circuit



**Maximum ratings**

Supply voltage  
Output current  
Differential input voltage  $V_{CC} = \pm 13$  to  $\pm 15$  V  
Differential input voltage  $V_{CC} = \pm 2$  to  $\pm 13$  V  
Junction temperature  
Storage temperature  
Thermal resistance:  
System-ambient air

	<b>TBB 4331 A</b> <b>TBE 4335 A</b>	
$V_{CC}$	$\pm 15$	V
$I_q$	70	mA
$V_{iD}$	$\pm 13$	V
$V_{iB}$	$\pm V_{CC}$	
$T_j$	150	°C
$T_s$	-55 to +125	°C
$R_{thSamb}$	140	k/W

**Range of operation**

Supply voltage  
Ambient temperature in operation  
TBB 4331 A  
TBE 4335 A

$V_{CC}$	$\pm 2$ to $\pm 15$	V
$T_{amb}$	0 to +70	°C
$T_{amb}$	-25 to +85	°C

**Operating characteristics**

( $V_{CC} = \pm 15$  V,  $T_{amb} = 25^\circ\text{C}$ )

Supply current  
Input offset voltage  
( $R_G = 50 \Omega$ )  
Input offset current  
Input current  
Output voltage  
( $R_L = 2 \text{ k}\Omega$ )  
( $R_L = 620 \Omega$ )  
Input impedance  
( $f = 1 \text{ kHz}$ )  
Open-loop voltage gain  
( $R_L = 2 \text{ k}\Omega$ ,  $f = 100 \text{ Hz}$ )  
( $R_L = 10 \text{ k}\Omega$ ,  $f = 100 \text{ Hz}$ )  
Output saturation voltage  
( $I_q = 10 \text{ mA}$ )  
Output leakage current  
Input common-mode range  
( $R_L = 2 \text{ k}\Omega$ )  
Common-mode rejection ration  
( $R_L = 2 \text{ k}\Omega$ )  
Sensitivity to supply voltage variation  
( $G_V = 100$ )  
Temp.-coefficient of  $V_{io}$   
( $R_G = 50 \Omega$ )  
Temp.-coefficient of  $I_{io}$   
( $R_G = 50 \Omega$ )  
 $V_{CC} = \pm 5$  V  
Supply current  
Input offset voltage  
Input offset current  
Input current  
Open-loop voltage gain  
( $R_L = 2 \text{ k}\Omega$ ,  $f = 1 \text{ kHz}$ )  
Output voltage ( $R_L = 2 \text{ k}\Omega$ )

	<b>TBB 4331 A</b> <b>TBE 4335 A</b>			
	min	typ	max	
$I_{CC}$		1	3	mA
$V_{io}$	-15		15	mV
$I_{io}$	-25		25	nA
$I_i$		30	50	nA
$V_{qpp}$	14.9		-14	V
$V_{qpp}$	14.9		-12.5	V
$Z_i$		3		M $\Omega$
$G_V$	75	80		dB
$G_V$		85		dB
$V_{qsat}$			1	V
$I_{qlik}$		1	10	$\mu\text{A}$
$V_{iCM}$	12	$\pm 13.5$	-12	V
$CMRR$	65	79		dB
$\frac{\Delta V_{io}}{V_{CC}}$		25	100	$\mu\text{V/V}$
$\alpha_{V_{io}}$		12		$\mu\text{V/K}$
$\alpha_{I_{io}}$		50		pA/K
$I_{CC}$		1		mA
$V_{io}$	-15		15	mV
$I_{io}$	-25	$\pm 10$	25	nA
$I_i$		30	50	nA
$G_V$	70			dB
$V_{qpp}$	4.9		-4	V