Operational Amplifier with Darlington Input

TCA 311; A; W
TCA 312
TCA 315; A; W

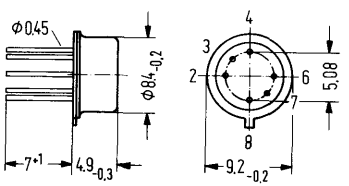
An economical operational amplifier which is well suited to be used as a Schmitt-trigger or comparator for control applications and automobile electronics. The output has been designed to control TTL-circuits directly. In addition to a high gain, low offset-voltage, small temperature- and supply voltage dependence, the amplifier features

- Very high input resistance
- Wide common-mode range
- Large supply voltage range
- Large control range
- High output current
- Low output saturation voltage
- TTL compatible

Type	Ordering codes
TCA 311	Q67000-A1001
TCA 311 A	Q67000-A1002
TCA 311 W	Q67000-A1003
TCA 312	Q67000-A1004
TCA 315	Q67000-A1011
TCA 315 A	Q67000-A561
TCA 315 W	Q67000-A1005

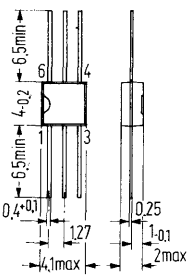
Package outlines

TCA 311, TCA 312, TCA 315



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

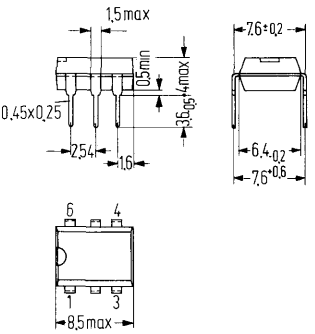
TCA 311 W TCA 315 W



Miniature plastic
package
6 pins
Weight approx. .1 g
Colour code
TCA 311 W red/white
TCA 315 W red/yellow

Dimensions in mm

TCA 311 A, TCA 315 A



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

Maximum ratings

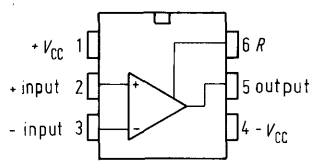
		TCA 311/A/W TCA 312 TCA 315/A/W	
Supply voltage	V_{CC}	±15	V
Output current	I_q	70	mA
Current at pin R	I_R	10	mA
Differential input voltage V_{CC} = ±13 to ±15 V	V_{iD}	±13	V
Differential input voltage V_{CC} = ±2 to ±13 V	V_{iD}	$\pm V_{CC}$	
Junction temperature	T_j	150	°C
Storage temperature	T_s	−55 to +125	°C
Thermal resistances:			
System-case (TCA 311, 312, 315)	$R_{thScase}$	80	K/W
System-ambient air (TCA 311, 312, 315)	R_{thSamb}	190	K/W
System-ambient air (TCA 311 A, 315 A)	R_{thSamb}	140	K/W
System-ambient air (TCA 311 W, 315 W)	R_{thSamb}	200	K/W

Range of operation

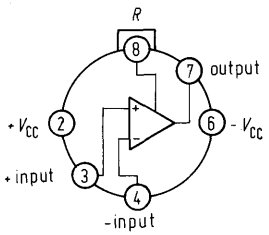
Supply voltage	V_{CC}	±2 to ±15	V
Ambient temperature in operation TCA 311/A/W	T_{amb}	0 to +70	°C
TCA 315/A/W	T_{amb}	−25 to +85	°C
TCA 312	T_{amb}	−55 to +125	°C

Pin connection

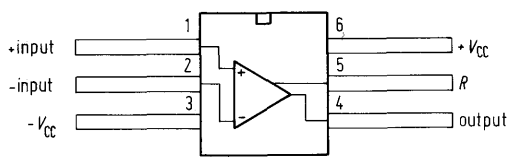
TCA 311 A
TCA 315 A



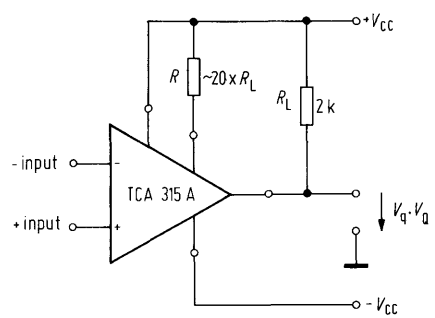
TCA 311
TCA 312
TCA 315



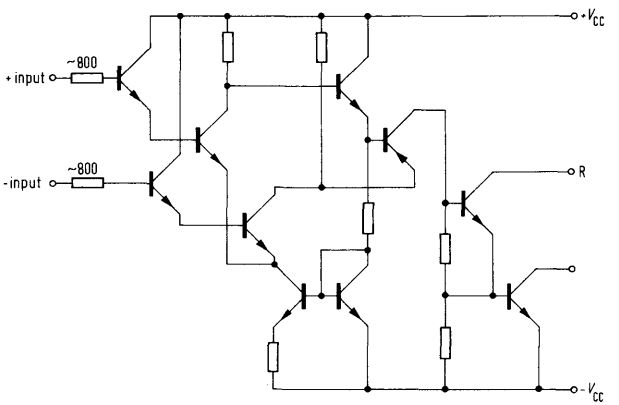
TCA 311 W
TCA 315 W



Connection diagram
R_L = load resistance



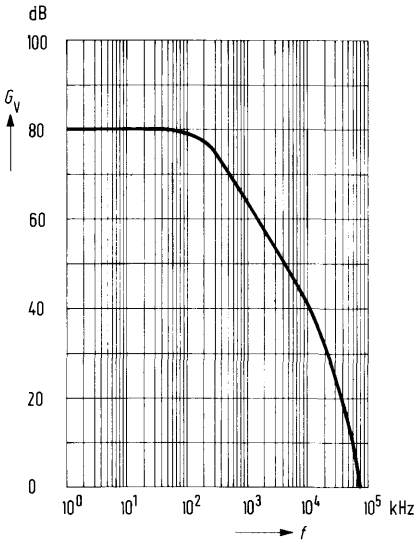
Circuit diagram



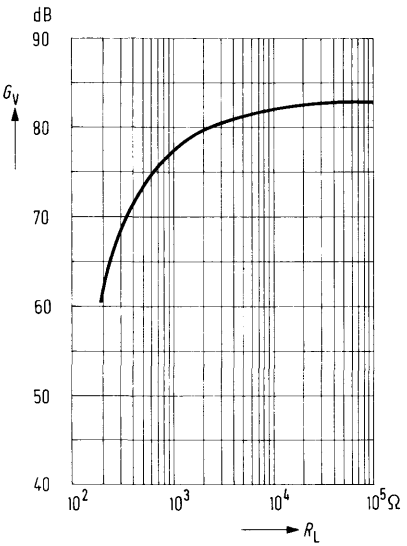
Operating characteristics (V_{CC} = ±15 V, R = 6.8 kΩ)		**TCA 311/A/W TCA 315/A/W** T_{amb} = 25°C			**TCA 312** T_{amb} = 25°C			T_{amb} = −55 to 125°C		
		min	typ	max	min	typ	max	min	max	
Supply current	I_{CC}		1.5	2.5		1.5	2.5			mA
Input offset voltage (R_G = 50 Ω)	V_{io}	−20		20	−14		14	−20	20	mV
Input offset current	I_{io}	−25	±10	25	−15		15	−40	40	nA
Input current (V_{iD} = 0)	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		−14.8	14.9		−14.8	14.8	−14.6	V
(R_L = 620 Ω)	V_{qpp}	14.9		−14.0	14.9		−14.8	14.8	−13.5	V
(R_L = 2 kΩ, f = 100 kHz)	V_{qpp}		±10			±10				V
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		60			60				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 variation (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)	Δ_{Vio}		12			12	50			μV/K
Temp. coefficient of I_{io}	Δ_{Iio}		50			50				pA/K

Operating characteristics (continued) $V_{CC} = \pm 15$ V; $R = 6.8$ kΩ		**TCA 311/A/W TCA 315/A/W** $T_{amb} = 25$ °C			**TCA 312** $T_{amb} = 25$ °C			$T_{amb} = -55$ to $+125$ °C		
		min	typ	max	min	typ	max	min	max	
Rise time of V_q for non-inverting operation (see TAA 761 test circuit 1)	$\frac{dV_q}{dt_r}$		30			30				V/μs
Output saturation voltage ($I_q = 10$ mA)	V_{qsat}			200			200		400	mV
Output leakage current	I_{qlk}		1	10		1	10			μA
$V_{CC} = \pm 5$ V, $R = 6.8$ kΩ										
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

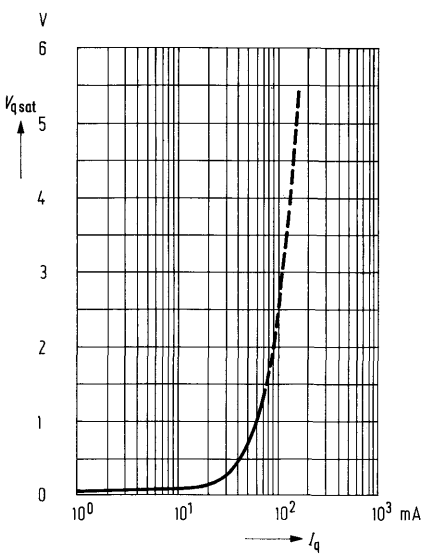
Open-loop voltage gain $G_V = f(f)$
$R_L = 2\ k\Omega$; $R = 6.8\ k\Omega$



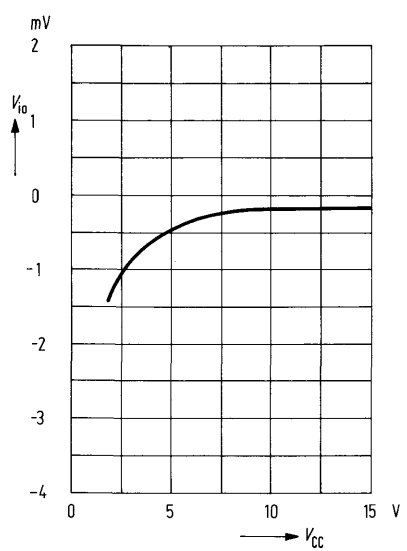
Open-loop voltage gain $G_V = f(R_L)$
$T_{amb} = 25\ °C$; $R = 6.8\ k\Omega$



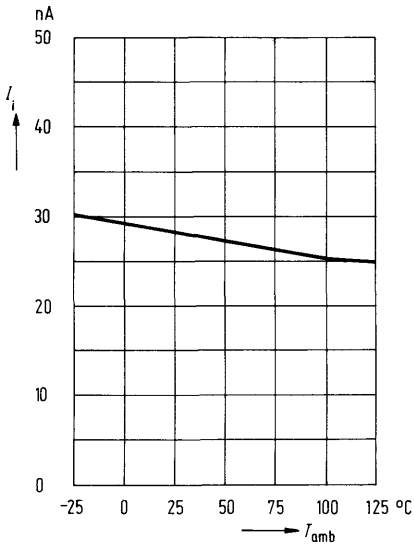
Output saturation voltage $V_{qsat} = f(I_q)$
$T_U = 25\ °C$; $R = 6.8\ k\Omega$



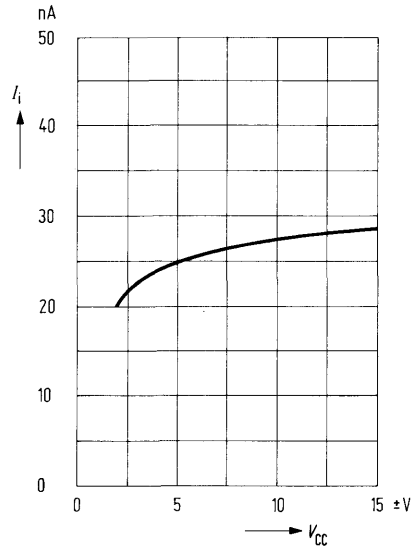
Input offset voltage $V_{io} = f(V_{CC})$
$T_{amb} = 25\ °C$; $R = 6.8\ k\Omega$



Input current $I_i = f(T_{amb})$
$R_L = 2\ k\Omega$; $V_{CC} = \pm 15\ V$



Input current $I_i = f(V_{CC})$
$T_{amb} = 25\ °C$; $R_L = 2\ k\Omega$



For further performance curves see TAA 761