SIEMENS

Comparators with Darlington Input TTL-Compatible

TCA 312
TCA 315

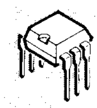
Bipolar IC

Features

- Very high input resistance
- Large control range
- High output current
- Low output saturation voltage
- Wide temperature range (TCA 312 A; G)
- NPN input
- Open collector output
- High slew rate

Applications

- Comparator
- Level converter
- Driver



P-DIP-6

P-DSO-6

Type	Ordering Code	Package	Color Code
S TCA 312 A	Q67000-A2048	P-DIP-6	–
TCA 312 G	Q67000-A2509	P-DSO-6 (SMD)	red
S TCA 315 A	Q67000-A561	P-DIP-6	–
S TCA 315 G	Q67000-A1005	P-DSO-6 (SMD)	red/yellow

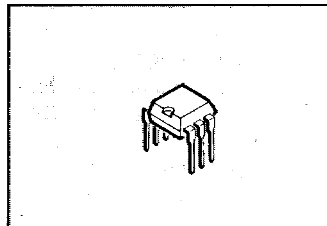
TCA 312 abd TCA 315 are suitable for use as Schmitt trigger or comparator in control engineering and automotive electronics. The output has been designed to control TTL circuits directly.

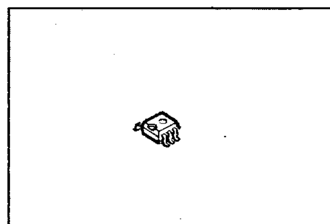
SIEMENS

Comparators, TTL-Compatible

TCA 322
TCA 325

Bipolar IC


P-DIP-6


P-DSO-6

Features

- Wide common-mode range
- Large supply voltage range
- Large control range
- High output current
- Low output saturation voltage
- Wide temperature range (TCA 322)
- NPN input
- Open collector output
- High slew rate

Applications

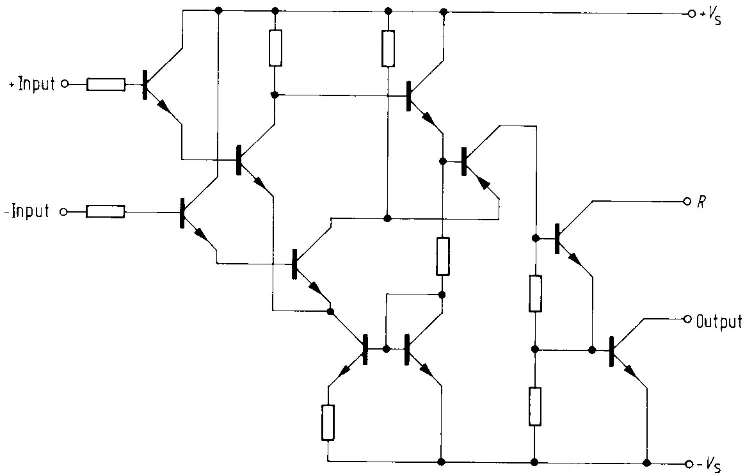
- Comparator
- Level converter
- Impedance converter
- Driver

Type	Ordering Code	Package	Color Code
■ S TCA 322 A	Q67000-A2501	P-DIP-6	–
■ TCA 322 G	Q67000-A2508	P-DSO-6 (SMD)	brown
■ S TCA 325 A	Q67000-A562	P-DIP-6	–
■ S TCA 325 G	Q67000-A1012	P-DSO-6 (SMD)	green/yellow

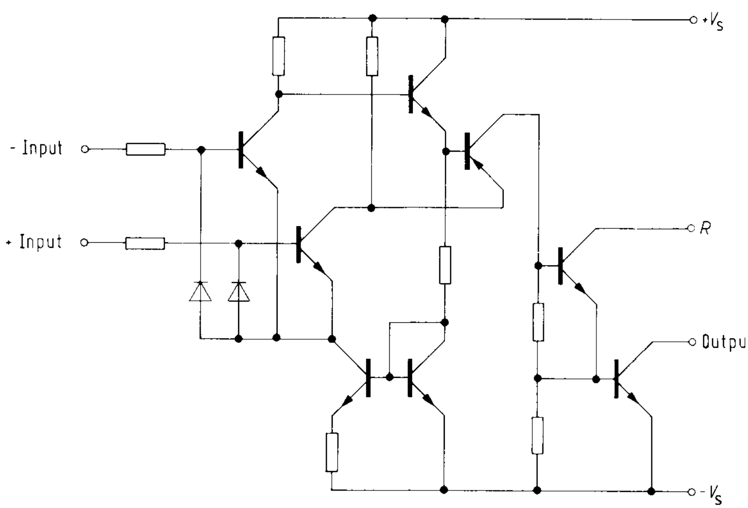
■ = Not for new design

TCA 322 and TCA 325 are suitable for use as Schmitt trigger or comparator in control engineering and automotive electronics. The output has been designed to control TTL circuits directly.

Circuit Diagram TCA 312/315

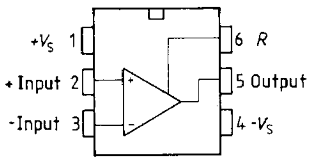


Circuit Diagram TCA 322/325

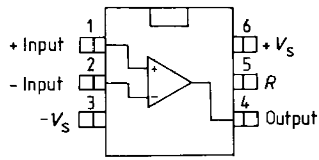


Pin Configurations
(top view)

TCA 312 A; TCA 322 A
TCA 315 A; TCA 325 A

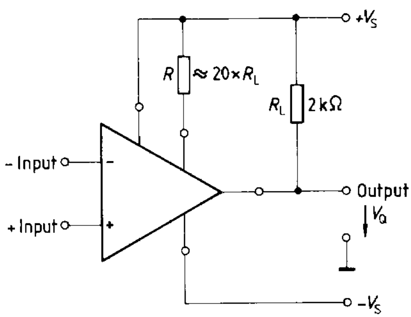


TCA 312 G; TCA 322 G
TCA 315 G; TCA 325 G



Connection Diagram

R_L = load resistance (collector resistance)



2

Absolute Maximum Ratings

Parameter	Symbol	Limit Values	Unit
Supply voltage	V_S	± 15	V
Output current Driver current	I_Q I_{dr}	70 10	mA mA
Differential input voltage V_S = 13 to 15 V Differential input voltage V_S = 2 to 13 V	 V_{ID} V_{ID}	 ± 13 ± V_S	 V V
Junction temperature Storage temperature range	T_j T_{stg}	150 –55 to 125	°C °C
Thermal resistance system – air TCA 312 A system – air TCA 312 G	 $R_{th\ SA}$ $R_{th\ SA}$	 115 200	 K/W K/W

Operating Range

Supply voltage	V_S	± 2 to ± 15	V
Ambient temperature	T_A	–55 to 125	°C

Characteristics

V_S = ± 5 V to ± 15 V; R = 6.8 kΩ
R_L = 2 kΩ
unless otherwise specified

Parameter	Symbol	Limit Values T_A = 25 °C			Limit Values T_A = –55 to 125 °C		Unit
		min.	typ.	max.	min.	max.	
Open-loop supply current consumption	I_S		1.5	2.5		2.5	mA
Input offset voltage R_G = 50 Ω	V_{IO}	–10		10	–15	15	mV
Input offset current	I_{IO}	–5		5	–10	10	nA
Input current	I_I		5	15		25	nA
Input current V_{ID} = ± 13 V	I_I			200			nA
Control range V_S = ± 15 V	$V_{Q\ pp}$	14.9		–14.8	14.8	–14.6	V
R_L = 620 Ω, V_S = ± 15 V	$V_{Q\ pp}$	14.9		–14.0	14.8	–13.5	V
V_S = ± 15 V, f = 100 kHz	$V_{Q\ pp}$		± 10				V

Characteristics
$V_S = \pm 5$ V to ± 15 V; $R = 6.8$ kΩ,
$R_L = 2$ kΩ,
unless otherwise specified

Parameter	Symbol	Limit Values $T_A = 25$ °C			Limit Values $T_A = -55$ to 125 °C		
		min.	typ.	max.	min.	max.	
Input impedance $f = 1$ kHz	Z_i		3				MΩ
Open-loop voltage gain $f = 1$ kHz $R_L = 10$ kΩ, $f = 1$ kHz $f = 1$ MHz	 G_{V0} G_{V0} G_{V0}	 80	 83 88 60		 75		 dB dB dB
Common-mode input voltage range	V_{IC}	$-V_S+2$		V_S-2	$-V_S+3$	V_S-3	V
Common-mode rejection	k_{CMR}	75	80		70		dB
Supply voltage rejection $G_V = 100$	k_{SVR}		25	200		200	µV/V
Temperature coefficient of V_{IO} $R_G = 50$ Ω Temperature coefficient of I_{IO} $R_G = 50$ Ω	α_{VIO} α_{IIO}		12 50	50			µV/K pA/K
Slew rate of V_q for non-inverting operation[1]) (see TAA 765, test circuit 1)	SR		30				V/µs
Output saturation voltage $I_Q = 10$ mA	V_{Qsat}			200		400	mV
Output reverse current	I_{QR}			1		5	µA

Characteristics
$V_S = \pm 2$ V; $R = 6.8$ kΩ, $R_L = 2$ kΩ

Input offset voltage $R_G = 50$ Ω	V_{IO}	−10		10	−15	15	mV
Input offset current Input current	I_{IO} I_I	−5	 5	5 15	−10	10 25	nA nA
Open-loop voltage gain $f = 1$ kHz	G_{V0}	75			70		dB

[1]) For the relationship between power bandwidth and slew rate refer to **"General Technical Information"**

Absolute Maximum Ratings

Parameter		Symbol	Limit Values	Unit
Supply voltage		V_S	± 15	V
Output current Driver current		I_Q I_{dr}	70 10	mA mA
Differential input voltage V_S = 13 to 15 V Differential input voltage V_S = 2 to 13 V		V_{ID} V_{ID}	± 13 ± V_S	V V
Junction temperature Storage temperature range		T_j T_{stg}	150 −55 to 125	°C °C
Thermal resistance system – air system – air	 TCA 315 A TCA 315 G	 $R_{th\ SA}$ $R_{th\ SA}$	 115 200	 K/W K/W

Operating Range

Supply voltage	V_S	± 2 to ± 15	V
Ambient temperature	T_A	−25 to 85	°C

Characteristics

V_S = ± 5 V to ± 15 V
R = 6.8 kΩ, R_L = 2 kΩ,
unless otherwise specified

Parameter	Symbol	Limit Values T_A = 25 °C			Limit Values T_A = −25 to 85 °C		Unit
		min.	typ.	max.	min.	max.	
Open-loop supply current consumption	I_S		1.5	2.5		2.5	mA
Input offset voltage R_G = 50 Ω	V_{IO}	−15		15	−18	18	mV
Input offset current Input current Input current V_{ID} = ± 13 V	I_{IO} I_I I_I	−10	 5	10 25 200	−20	20 35	nA nA nA
Control range V_S = ± 15 V R_L = 620 Ω; V_S = ± 15 V V_S = ± 15 V, f = 100 kHz	 $V_{Q\ pp}$ $V_{Q\ pp}$ $V_{Q\ pp}$	 14.9 14.9	 ± 10	 −14.8 −14.0	 14.8 14.8	 −14.6 −13.5	 V V V

Characteristics

$V_S = \pm 5$ V to ± 15 V; $R = 6.8$ kΩ,
$R_L = 2$ kΩ,
unless otherwise specified

		Limit Values $T_A = 25$ °C			Limit Values $T_A = -25$ to 85 °C		
Parameter	**Symbol**	**min.**	**typ.**	**max.**	**min.**	**max.**	**Unit**
Input impedance $f = 1$ kHz	Z_i		3				MΩ
Open-loop voltage gain $f = 1$ kHz $R_L = 10$ kΩ, $f = 1$ kHz $f = 1$ MHz	 G_{V0} G_{V0} G_{V0}	 75	 80 85 60		 75		 dB dB dB
Common-mode input voltage range	V_{IC}	$-V_S+2$		V_S-2	$-V_S+3$	V_S-3	V
Common-mode rejection	k_{CMR}	70	78		70		dB
Supply voltage rejection $G_V = 100$	k_{SVR}		25	200		200	µV/V
Temperature coefficient of V_{IO} $R_G = 50$ Ω Temperature coefficient of I_{IO} $R_G = 50$ Ω	α_{VIO} α_{IIO}		12 50	50			µV/K pA/K
Slew rate of V_q for non-inverting operation[1]) (see TAA 765, test circuit 1)	SR		30				V/µs
Output saturation voltage $I_Q = 10$ mA	V_{Qsat}			200		400	mV
Output reverse current	I_{QR}			10		20	µA

Characteristics

$V_S = \pm 2$ V; $R = 6.8$ kΩ, $R_L = 2$ kΩ

Input offset voltage $R_G = 50$ Ω	V_{IO}	−17		17	−20	20	mV
Input offset current Input current	I_{IO} I_I	−10	 5	10 25	−20	20 35	nA nA
Open-loop voltage gain $f = 1$ kHz	G_{V0}	70			70		dB

[1]) For the relationship between power bandwidth and slew rate refer to **"General Technical Information"**

Absolute Maximum Ratings

Parameter		Symbol	Limit Values	Unit
Supply voltage		V_S	± 15	V
Output current Driver current at R		I_Q I_{dr}	70 10	mA mA
Differential input voltage		V_{ID}	± V_S	V
Junction temperature Storage temperature range		T_j T_{stg}	150 −55 to 125	°C °C
Thermal resistance system – air system – air	 TCA 322 A TCA 322 G	 $R_{th\ SA}$ $R_{th\ SA}$	 115 200	 K/W K/W

Operating Range

Supply voltage	V_S	± 2 to ± 15	V
Ambient temperature	T_A	−55 to 125	°C

Characteristics

$V_S = \pm 5$ V to ± 15 V
$R = 6.8$ kΩ, $R_L = 2$ kΩ,
unless otherwise specified

Parameter	Symbol	Limit Values $T_A = 25$ °C min.	typ.	max.	Limit Values $T_A = -55$ to 125 °C min.	max.	Unit
Open-loop supply current consumption	I_S		1.5	2.5		2.5	mA
Input offset voltage $R_G = 50\ \Omega$	V_{IO}	− 4		4	− 6	6	mV
Input offset current Input current	I_{IO} I_I	−100	± 50 0.3	100 0.7	−300	300 1.0	nA µA
Control range $V_S = \pm 15$ V $R_L = 620\ \Omega$, $V_S = \pm 15$ V $V_S = \pm 15$ V, $f = 100$ kHz	 $V_{Q\ pp}$ $V_{Q\ pp}$ $V_{Q\ pp}$	 14.9 14.9	 ± 10	 −14.8 −14.0	 14.8 14.8	 −14.6 −13.5	 V V V

Characteristics
$V_S = \pm 5$ V to ± 15 V
$R = 6.8$ kΩ, $R_L = 2$ kΩ,
unless otherwise specified

Parameter	Symbol	Limit Values $T_A = 25$ °C min.	typ.	max.	Limit Values $T_A = -55$ to 125 °C min.	max.	Unit
Input impedance $f = 1$ kHz	Z_i		200				kΩ
Open-loop voltage gain $f = 1$ kHz $R_L = 10$ kΩ, $f = 1$ kHz $f = 1$ MHz	 G_{V0} G_{V0} G_{V0}	 85	 87 92 60		 80		 dB dB dB
Common-mode input voltage range	V_{IC}	$-V_S+2$		V_S-2	$-V_S+3$	V_S-3	V
Common-mode rejection	k_{CMR}	80	85		75		dB
Supply voltage rejection $G_V = 100$	k_{SVR}		25	200		200	µV/V
Temperature coefficient of V_{IO} $R_G = 50$ Ω Temperature coefficient of I_{IO} $R_G = 50$ Ω	α_{VIO} α_{IIO}		6 0.3	25 1.5			µV/K nA/K
Slew rate of V_q for non-inverting operation[1]) (see TAA 765, test circuit 1)	SR		50				V/µs
Output saturation voltage $I_Q = 10$ mA	$V_{Q\,sat}$			200		400	mV
Output reverse current	I_{QR}			1		5	µA

Characteristics
$V_S = \pm 2$ V; $R = 6.8$ kΩ, $R_L = 2$ kΩ,
unless otherwise specified

Parameter	Symbol	min.	typ.	max.	min.	max.	Unit
Input offset voltage $R_G = 50$ Ω	V_{IO}	−4		4	−6	6	mV
Input offset current Input current	I_{IO} I_I	−70	 0.2	70 0.5	−200	200 0.8	nA µA
Open-loop voltage gain $f = 1$ kHz	G_{V0}	80			75		dB

[1]) For the relationship between power bandwidth and slew rate refer to **"General Technical Information"**

Absolute Maximum Ratings

Parameter	Symbol	Limit Values	Unit
Supply voltage	V_S	± 15	V
Output current Driver current at R	I_Q I_{dr}	70 10	mA mA
Differential input voltage	V_{ID}	$\pm V_S$	V
Junction temperature Storage temperature range	T_j T_{stg}	150 −55 to 125	°C °C
Thermal resistance system – air TCA 325 A system – air TCA 325 G	 $R_{th\ SA}$ $R_{th\ SA}$	 115 200	 K/W K/W

Operating Range

Supply voltage	V_S	± 2 to ± 15	V
Ambient temperature	T_A	−25 to 85	°C

Characteristics

$V_S = \pm 5$ V to ± 15 V
$R = 6.8$ kΩ, $R_L = 2$ kΩ,
unless otherwise specified

Parameter	Symbol	Limit Values $T_A = 25$ °C			Limit Values $T_A = -25$ to 85 °C		Unit
		min.	typ.	max.	min.	max.	
Open-loop supply current consumption	I_S		1.5	2.5		2.5	mA
Input offset voltage $R_G = 50$ Ω	V_{IO}	−5.5		5.5	−7	7	mV
Input offset current Input current	I_{IO} I_I	−200	± 80 0.5	200 0.8	−300	300 1.0	nA µA
Control range $V_S = \pm 15$ V $R_L = 620$ Ω, $V_S = \pm 15$ V $V_S = \pm 15$ V, $f = 100$ kHz	 $V_{Q\ pp}$ $V_{Q\ pp}$ $V_{Q\ pp}$	 14.9 14.9	 ± 10	 −14.8 −14.0	 14.8 14.8	 −14.6 −13.5	 V V V

Characteristics

$V_S = \pm 5$ V to ± 15 V; $R = 6.8$ kΩ, $R_L = 2$ kΩ,
unless otherwise specified

Parameter	Symbol	Limit Values $T_A = 25$ °C			Limit Values T_A –25 to 85 °C		Unit
		min.	typ.	max.	min.	max.	
Input impedance $f = 1$ kHz	Z_I		200				kΩ
Open-loop voltage gain $f = 1$ kHz $R_L = 10$ kΩ, $f = 1$ kHz $f = 1$ MHz	 G_{V0} G_{V0} G_{V0}	 80	 85 90 60		 80		 dB dB dB
Common-mode input voltage range	V_{IC}	$-V_S+2$		V_S-2	$-V_S+3$	V_S-3	V
Common-mode rejection	k_{CMR}	75	83		75		dB
Supply voltage rejection $G_V = 100$	k_{SVR}		25	200		200	µV/V
Temperature coefficient of V_{IO} $R_G = 50$ Ω Temperature coefficient of I_{IO} $R_G = 50$ Ω	α_{VIO} α_{IIO}		6 0.3				µV/K nA/K
Slew rate of V_q for non-inverting operation[1]) (see TAA 765, test circuit 1)	SR		50				V/µs
Output saturation voltage $I_Q = 10$ mA	$V_{Q\,sat}$			200		400	mV
Output reverse current	I_{QR}			10		20	µA

Characteristics

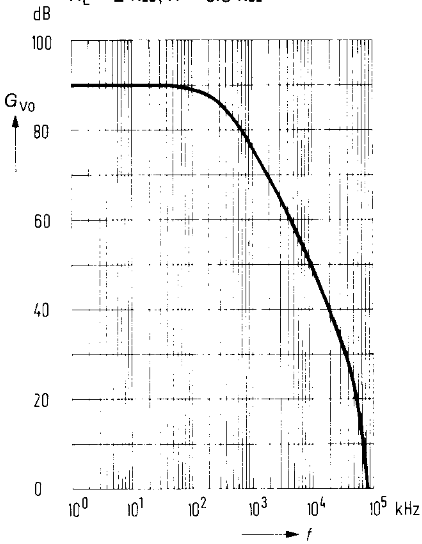
$V_S = \pm 2$ V; $R = 6.8$ kΩ, $R_L = 2$ kΩ

Parameter	Symbol	min.	typ.	max.	min.	max.	Unit
Input offset voltage $R_G = 50$ Ω	V_{IO}	–6		6	–7.5	7.5	mV
Input offset current Input current	I_{IO} I_I	–150	 0.2	150 0.6	–200	200 0.8	nA µA
Open-loop voltage gain $f = 1$ kHz	G_{V0}	75			75		dB

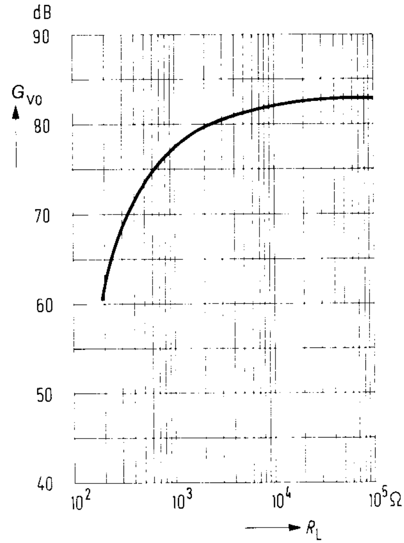
1) For the relationship between power bandwidth and slew rate refer to **"General Technical Information"**

2

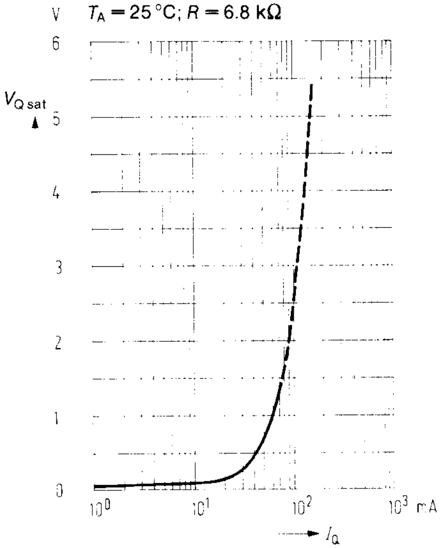
Open-loop voltage gain versus frequency
$R_L = 2\ k\Omega$; $R = 6.8\ k\Omega$



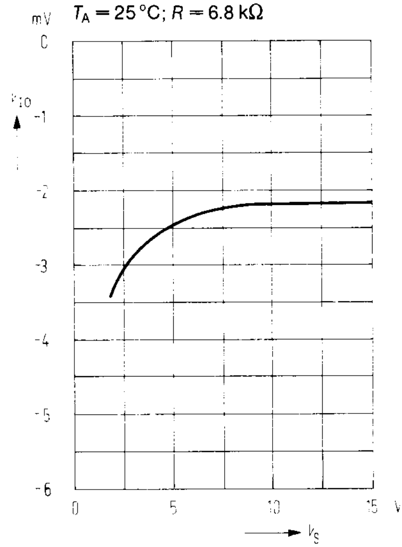
Open-loop voltage gain versus load resistance
$T_A = 25\ °C$; $R = 6.8\ k\Omega$



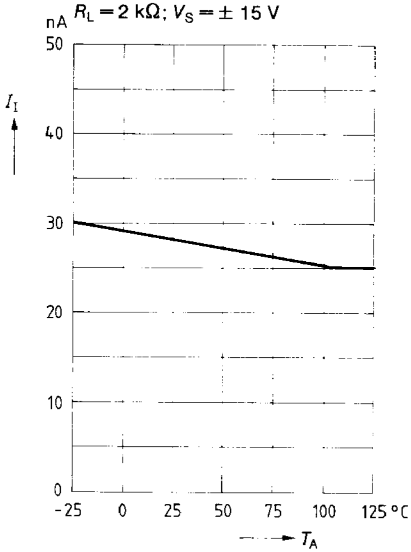
Output saturation voltage versus output current
$T_A = 25\ °C$; $R = 6.8\ k\Omega$



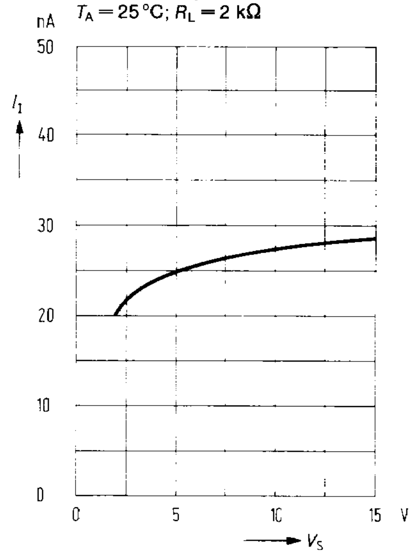
Input offset voltage versus supply voltage
$T_A = 25\ °C$; $R = 6.8\ k\Omega$



Input current versus ambient temperature
$R_L = 2\ k\Omega$; $V_S = \pm\ 15\ V$

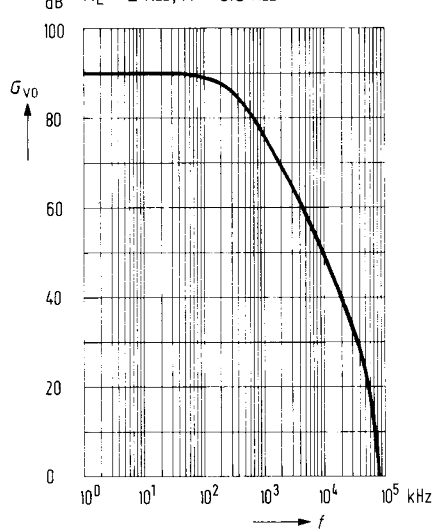


Input current versus supply voltage
$T_A = 25\ °C$; $R_L = 2\ k\Omega$

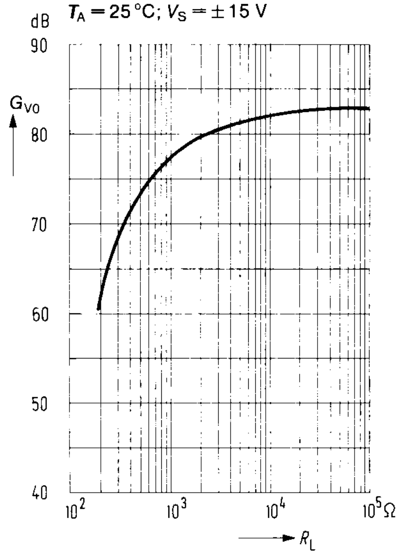


2

Open-loop voltage gain versus frequency
$R_L = 2$ kΩ; $R = 6.8$ kΩ



Open-loop voltage gain versus load resistance
$T_A = 25\,°C$; $V_S = \pm 15$ V



Output saturation voltage versus output current
$T_A = 25\,°C$; $R = 6.8$ kΩ