

## RGB Video Amplifier System for Monitors

### Description

The U2203B-A is a wideband video amplifier IC system especially designed for use in high-resolution RGB monitors. The IC includes three well matched video amplifiers, three gated differential amplifiers for black-

level clamping and brightness control and the function for simultaneously contrast control. Separate adjustment of the maximum gain of each amplifier is also possible.

### Features

- 3 channels, high bandwidth (90 MHz @ -3 dB)
- Matched attenuators for contrast control
- Black-level clamping for brightness control
- Independent gain control of each amplifier
- ESD protection according to MIL-STD. 883

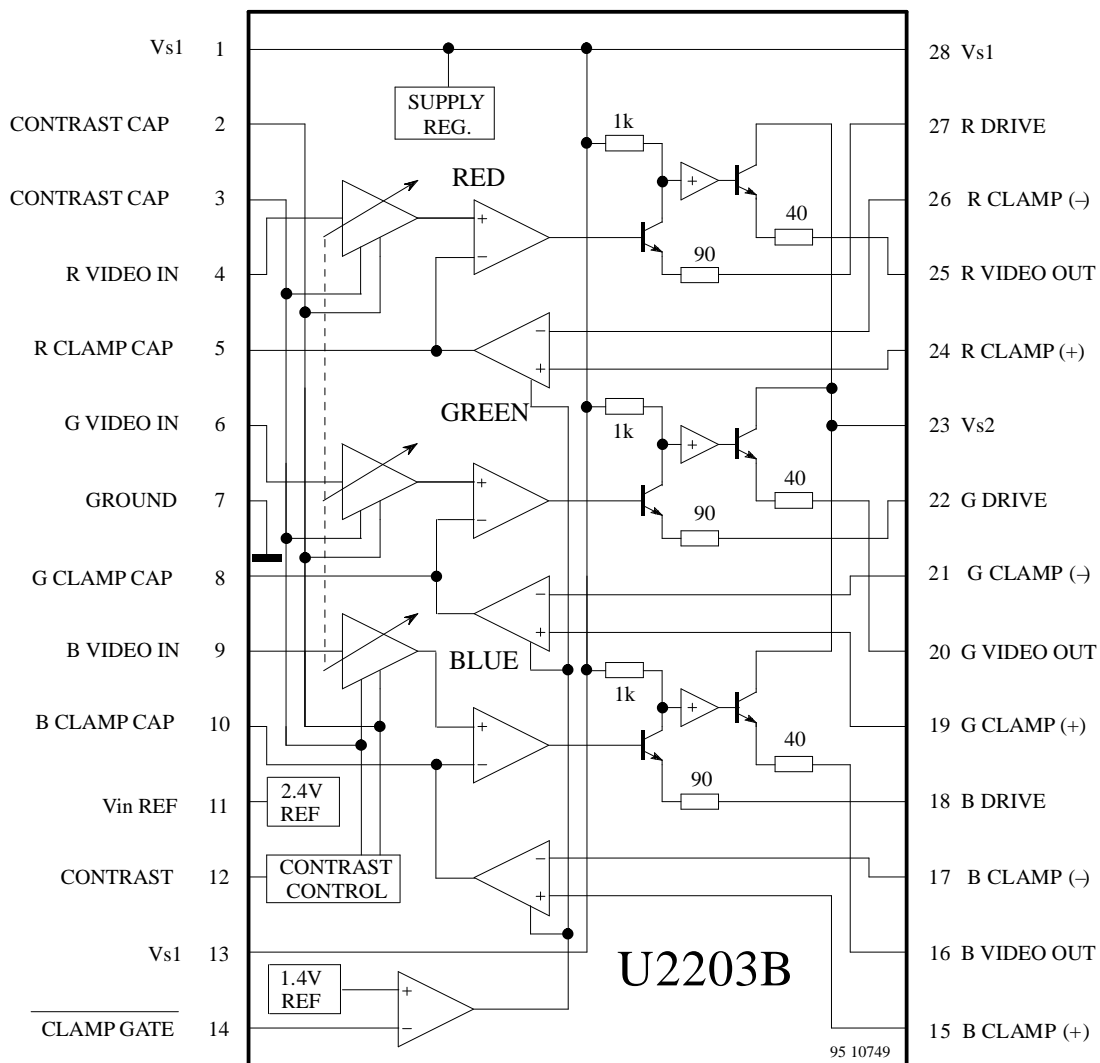


Figure 1. Block diagram

## Pin Description

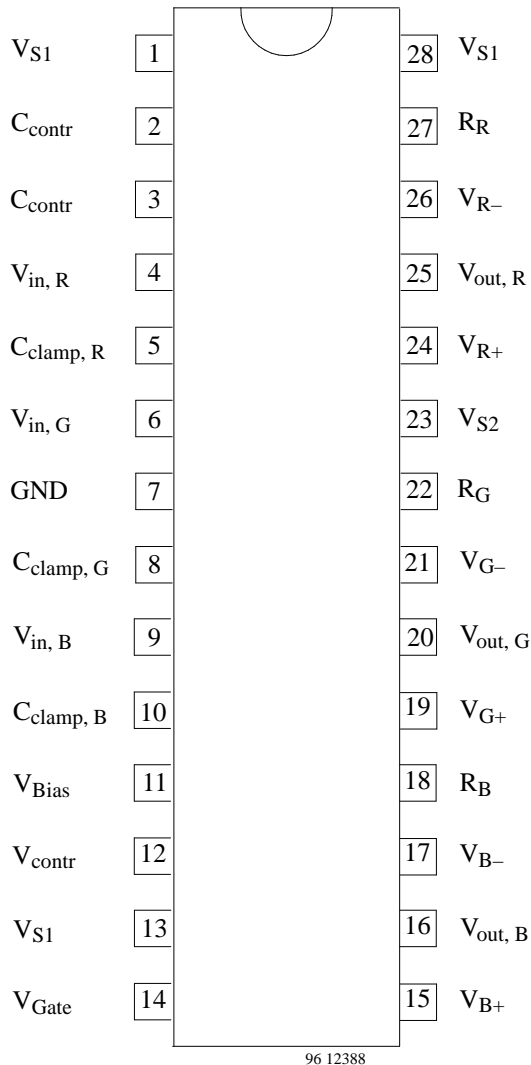


Figure 2. Pinning

Pin	Symbol	Function
1	$V_{S1}$	Supply voltage
2	$C_{contr}$	Contrast cap.
3	$C_{contr}$	Contrast cap.
4	$V_{in, R}$	Video input (R)
5	$C_{clamp, R}$	Clamp cap. (R)
6	$V_{in, G}$	Video input (G)
7	GND	Ground
8	$C_{clamp, G}$	Clamp cap. (G)
9	$V_{in, G}$	Video input (B)
10	$C_{clamp, B}$	Clamp cap. (B)
11	$V_{Bias}$	Bias voltage (RGB-inputs)
12	$V_{contr}$	Contrast control
13	$V_{S1}$	Supply voltage
14	$V_{Gate}$	Inverted clamp gate
15	$V_{B+}$	Clamp amplifier (B+)
16	$V_{in, B}$	Video output (B)
17	$V_{B-}$	Clamp amplifier (B-)
18	$R_B$	Drive resistor (B)
19	$V_{G+}$	Clamp amplifier (G+)
20	$V_{out, G}$	Video output (G)
21	$V_{G-}$	Clamp amplifier (G-)
22	$R_G$	Drive resistor (G)
23	$V_{S2}$	Supply voltage (outputs)
24	$V_{R+}$	Clamp amplifier (R+)
25	$V_{out, R}$	Video output (R)
26	$V_{R-}$	Clamp amplifier (R-)
27	$R_R$	Drive resistor (R)
28	$V_{S1}$	Supply voltage

## Absolute Maximum Ratings

Parameters	Symbol	Value	Unit
Supply voltage Pins 1, 13, 28 and 23	$V_S$	13.5	V
Input voltage at all other pins	$V_{in}$	0 to $V_S$	V
Video output current Pins 16, 20 and 25	$I_V$	28	mA
Junction temperature	$T_j$	125	°C
Storage temperature range	$T_{stg}$	-40 to 125	°C

## Operating Range

Parameters	Symbol	Value	Unit
Ambient temperature range	$T_{amb}$	0 to 80	°C
Supply voltage range Pins 1, 13, 23 and 28	$V_{S2}, V_{S1}$	11.0 to 13.0	V

## Thermal Resistance

Parameters	Symbol	Value	Unit
Junction ambient (DIP28)	$R_{thJA}$	46	K/W

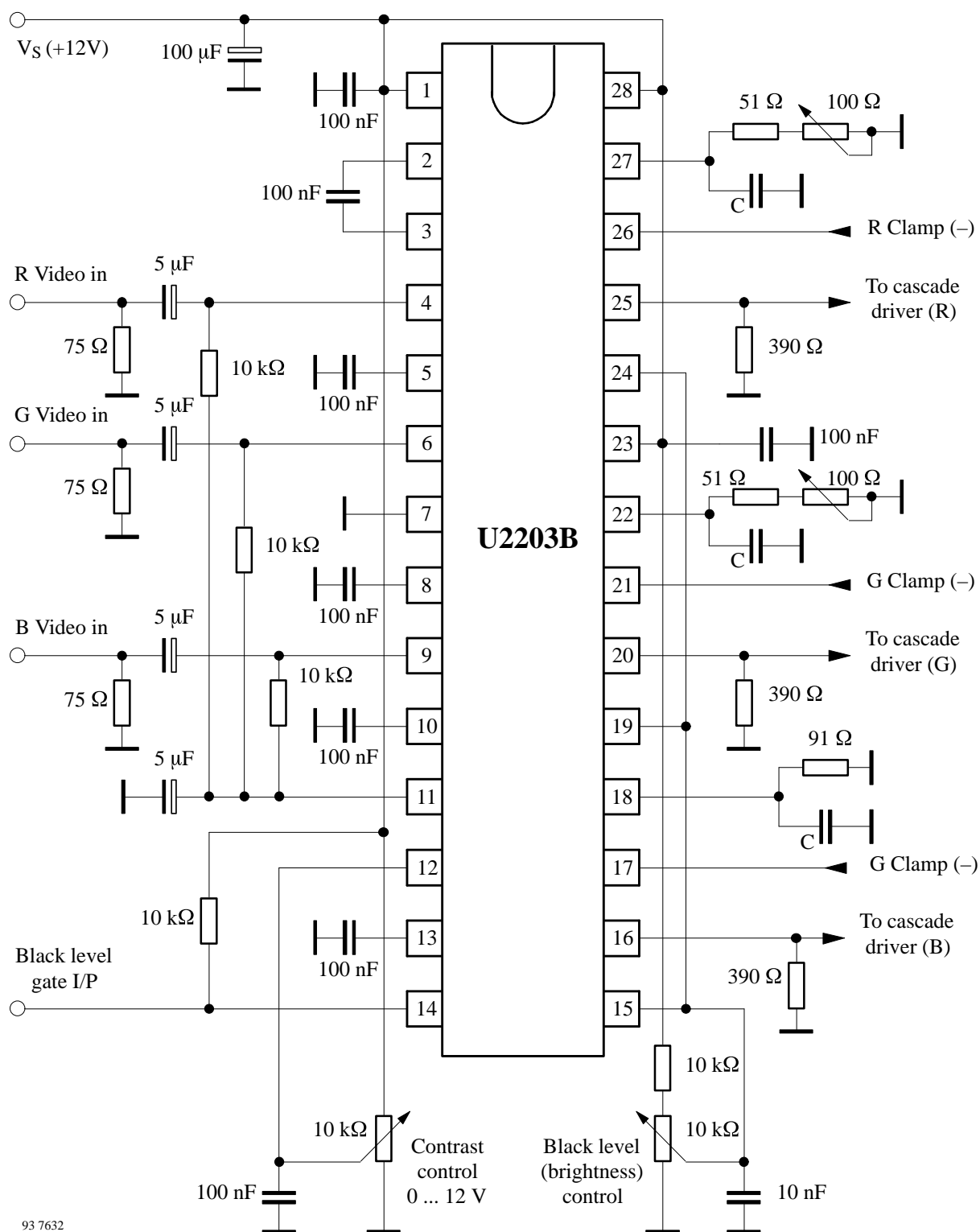
## Electrical Characteristics

Test conditions unless otherwise specified, reference point Pin 7,  $T_{amb} = 25^{\circ}\text{C}$ ,

$V_{S1} = V_{S2} = 12\text{ V}$ ,  $V_{12} = 6\text{ V}$  (contrast);  $V_{14} = 0\text{ V}$  (inv. gating);  $V_{15} = V_{19} = V_{24} = 2\text{ V}$  (brightness)

Parameters	Test Conditions / Pins	Symbol	Min.	Typ.	Max.	Unit
<b>DC-values</b>						
Supply current	$V_{S1}$ only, Pins 1, 13 and 28	$I_{S1}$		60	70	mA
Input bias voltage	Pin 11	$V_{inREF}$	2.3		2.5	V
Input bias current	Pins 4, 6 and 9	$I_{inREF}$	1	5	10	$\mu\text{A}$
Switching voltage gating "on"	Pin 14	VG "L"	0.8	1.3		V
Switching voltage gating "off"	Pin 14	VG "H"		1.5	2.0	V
Switching current gating "on"	$V_{14} = 0.8\text{ V}$ Pin 14	IG "L"	-1	-0.01		$\mu\text{A}$
Switching current gating "off"	$V_{14} = 2.0\text{ V}$ Pin 14	IG "H"		5	8	$\mu\text{A}$
Charge current clamping capacitor	$V_{5,8,10} = 0\text{ V}$ Pins 5, 8 and 10	ICL+	0.8	1.0	1.2	mA
Discharge current clamping capacitor	$V_{5,8,10} = 5\text{ V}$ Pins 5, 8 and 10	ICL-	-1.2	-1.0	-0.8	mA
<b>Video outputs, <math>V_O</math></b> Pins 16, 20 and 25						
Low level	$V_{5,8,10} = 0\text{ V}$	$V_{O" L"}$		0.8	1.0	V
High level	$V_{5,8,10} = V_S$	$V_{O" H"}$	8.0	8.6		V
Output offset between two amplifiers	$V_{15}, V_{19}, V_{24} = 2\text{ V}$	$\Delta V_O$ (2 V)			$\pm 50$	mV
	$V_{15}, V_{19}, V_{24} = 4\text{ V}$	$\Delta V_O$ (4 V)			$\pm 50$	mV
<b>Video gain</b> $V_{15} = V_{19} = V_{24} = 4\text{ V}$ (brightness); $f_{IN} = 1\text{ MHz}$						
Maximum video gain	$V_{12} = 12\text{ V}$	$G_{Vmax}$	16.0	17.7		dB
Middle video gain	$V_{12} = 5\text{ V}$	$G_{Vmid}$		8.5		dB
Dynamic gain range		GVD		50		dB
Video gain match (any 2 outputs)	$V_{12} = 12\text{ V}$	$GVM_{max}$		$\pm 0.1$		dB
	$V_{12} = 5\text{ V}$	$GVM_{mid}$		$\pm 0.1$		dB
	$V_{12} = 2.2\text{ V}$ 1)	$GVM_{-30}$		$\pm 0.3$		dB
<b>Video bandwidth</b>						
unpeaked ( $C = 0\text{ pF}$ ) optimal peaking ( $C = 27\text{ pF}$ )	$V_{12} = 12\text{ V}$ ( $f_{-3dB}$ )	BWV		65		MHz
	$V_{12} = 12\text{ V}$ ( $f_{-3dB}$ )	BWV <sub>P</sub>		90		MHz
Video cross talk	$f_{IN} = 10\text{ kHz}$	$CT_{10kHz}$	-50			dB
	$f_{IN} = 10\text{ MHz}$	$CT_{10MHz}$		-47		dB

1) Measured 30 dB below maximum gain



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Figure 3. Typical application circuit

**AC Characteristics**

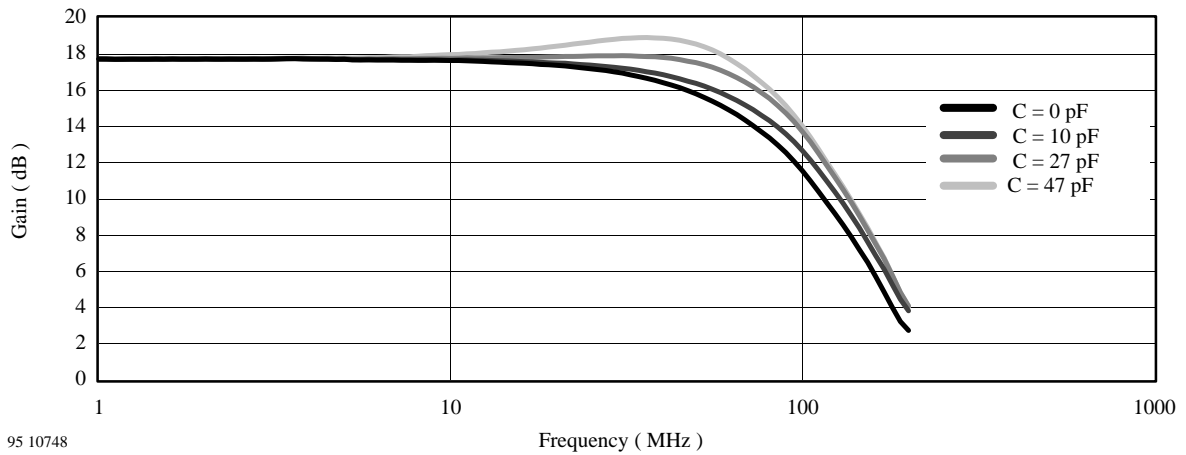


Figure 4. Gain vs. frequency (various peaking),  $V_{12} = 12$  V (contrast),  $V_{15} = V_{19} = V_{24} = 4$  V (brightness)

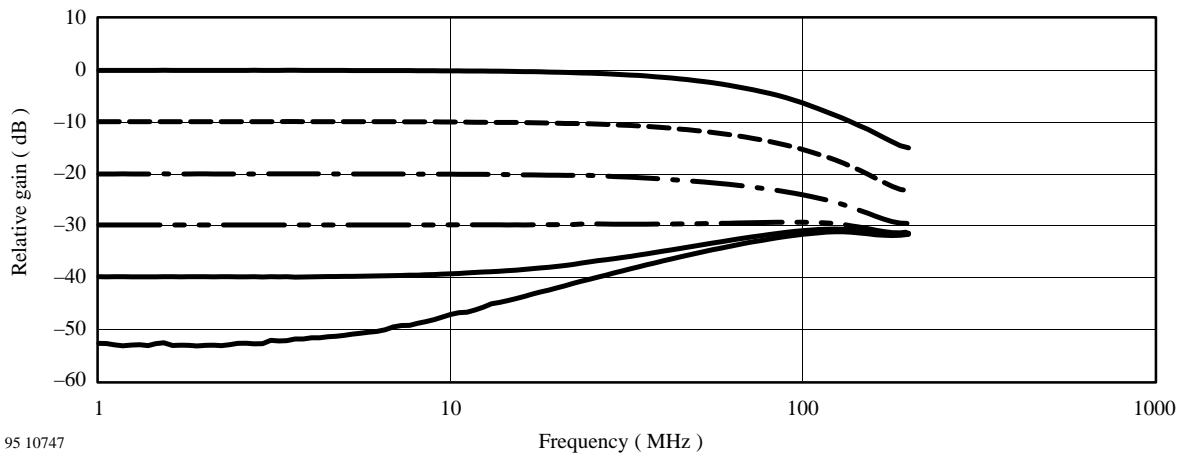


Figure 5. Relative gain vs. frequency (no peaking),  $V_{12} =$  variable (contrast),  $V_{15} = V_{19} = V_{24} = 4$  V (brightness),  $0 \text{ dBrel} = 17.7 \text{ dB}$ ,  $C = 0 \text{ pF}$

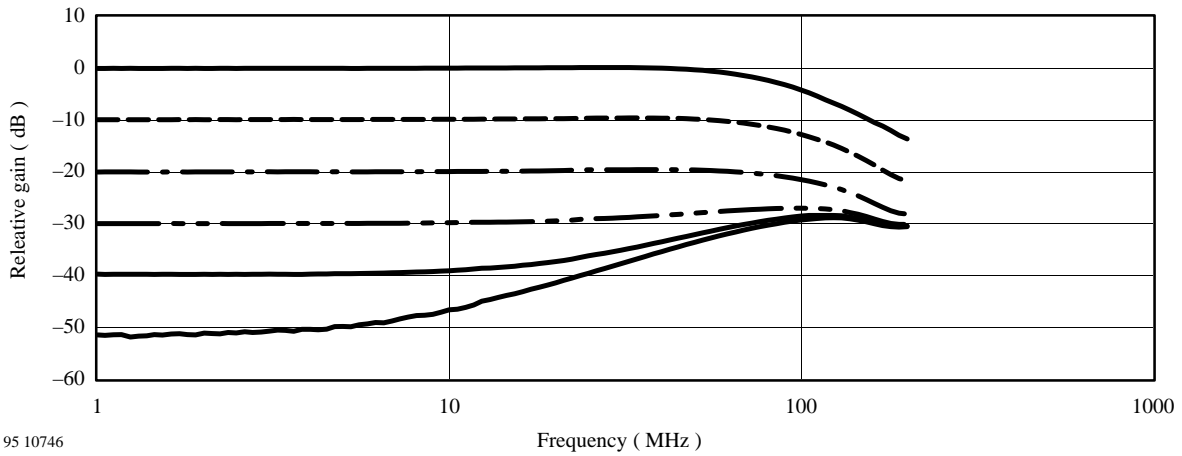
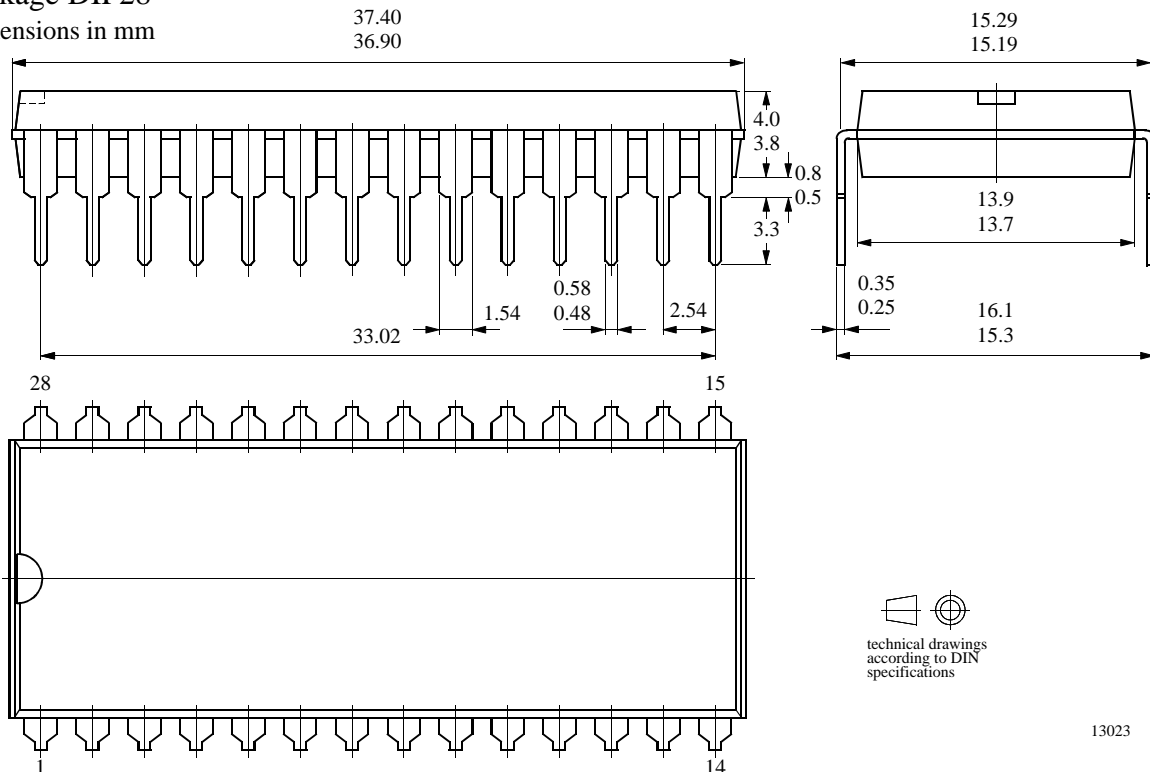


Figure 6. Rel. gain vs. frequency (optimized peaking),  $V_{12}$  = variable (contrast),  $V_{15} = V_{19} = V_{24} = 4$  V (brightness),  $0 \text{ dBrel} = 17.7 \text{ dB}$ ,  $C = 27 \text{ pF}$

## Package Information

### Package DIP28

Dimensions in mm



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