Philips Semiconductors

Data sheet	
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TDA4880
Advanced monitor video controller

FEATURES

- Fully DC controllable
- 3 separate video channels
- Input black level clamping
- Individual gain control for white level adjustment
- Brightness control with correct grey scale tracking
- Contrast control for the 3 channels simultaneously
- Cathode feedback to internal reference for black level control
- Current outputs for RGB signal currents
- RGB voltage outputs to external peaking circuits
- Blanking and switch off input for screen protection

GENERAL DESCRIPTION

The TDA4880 is a monolithic integrated RGB amplifier for colour monitor systems with super VGA performance, intended for DC or AC coupling of the colour signals to the cathodes of the CRT. With special advantages the circuit can be used in conjunction with the TDA4850.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_P	supply voltage range (pin 7)		7.2	8.0	8.8	V
I_P	supply current (pin 7)		–	40	–	mA
$V_{I(b\text{-}w)}$	input voltage (pins 2, 5 and 8) (black-to-white)		–	0.7	–	V
$V_{O(b\text{-}w)}$	output voltage (pins 19, 16 and 13) (black-to-white)		–	1.0	–	V
$I_{O(b\text{-}w)}$	output current (pins 20, 17 and 14) (black-to-white)		–	50	–	mA
I_M	peak output current (pins 20, 17 and 14)		–	100	–	mA
B	bandwidth	–3 dB	70	–	–	MHz
G_{nom}	nominal gain		–	3		dB
G_v	gain control range (relative to G_{nom})		–6	–	0	dB
C_v	contrast control range (relative to G_{nom})		–20	–	3	dB
ΔV_{bl}	brightnesss control range		–0.1	–	0.3	V
T_{amb}	operating ambient temperature range		0	–	70	°C

ORDERING INFORMATION

EXTENDED TYPE NUMBER	PACKAGE			
	PINS	PIN POSITION	MATERIAL	CODE
TDA4880	20	DIL	plastic	SOT146

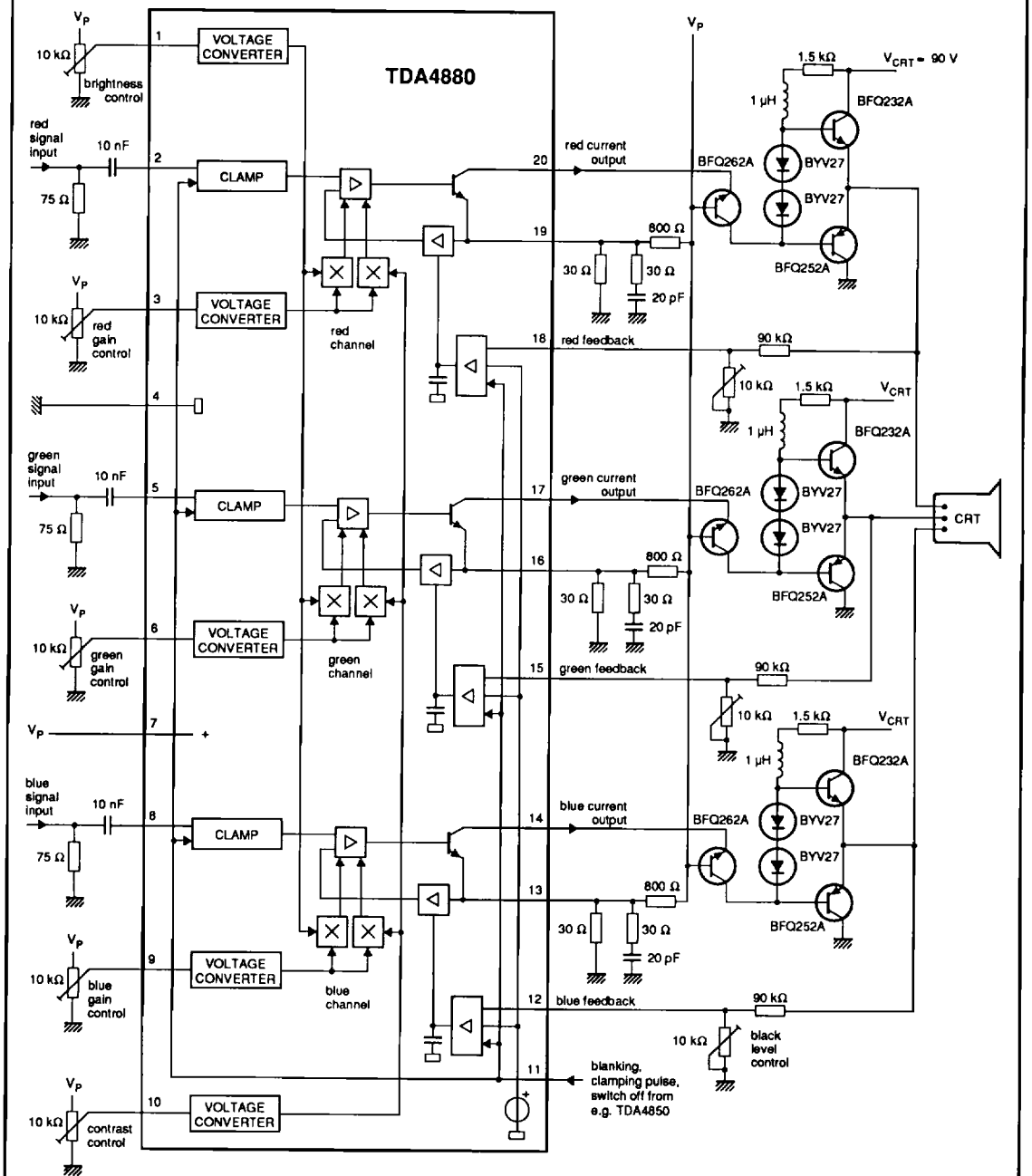

Fig. 1 Block diagram and basic application circuit for DC coupling.

PIN CONFIGURATION

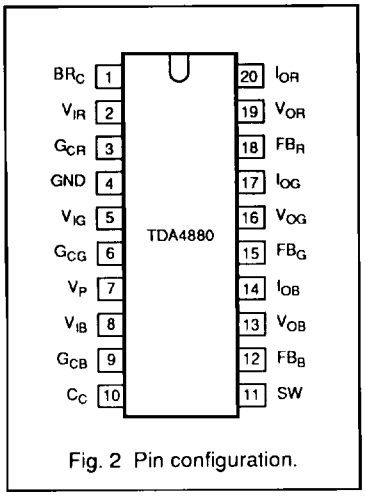

Fig. 2 Pin configuration.

PINNING

SYMBOL	PIN	DESCRIPTION
BR_C	1	brightness control
V_{IR}	2	red signal input
G_{CR}	3	red gain control
GND	4	ground
V_{IG}	5	green signal input
G_{CG}	6	green gain control
V_P	7	supply voltage
V_{IB}	8	blue signal input
G_{CB}	9	blue gain control
C_C	10	contrast control
SW	11	blanking / clamping pulse, switch off
FB_B	12	blue feedback
V_{OB}	13	blue voltage output
I_{OB}	14	blue current output
FB_G	15	green feedback
V_{OG}	16	green voltage output
I_{OG}	17	green current output
FB_R	18	red feedback
V_{OR}	19	red voltage output
I_{OR}	20	red current output

FUNCTIONAL DESCRIPTION

RGB input signals are capacitively coupled into the TDA4880 from a low ohmic source and are clamped to an internal DC voltage. Sync-on-green will not disturb normal operation. Each channel has a maximum voltage gain of 6 dB. With the nominal gain of 3 dB the nominal black-to-white output voltage is 1 V(p-p).

DC voltages are used for brightness, contrast and gain control.

For **brightness control** (pin 1) the signal black levels are shifted relative to a reference black level voltage. The brightness is set internally to the nominal brightness level during blanking and clamping pulses.

Contrast control is adjusted simultaneously for the three colour signals by a voltage at pin 10.

The **RGB gain controls** (pins 3, 6 and 9) adjust the RGB signal levels of each channel separately to provide the correct white point. Variable RGB gain affects contrast as well as brightness to achieve correct grey scale tracking.

Each **RGB output stage** provides a current output (pins 20, 17 and 14) and a voltage output (pins 19, 16 and 13).

External cascode transistors reduce power consumption and prevent breakdown of the output transistors.

RGB signal output currents and peaking characteristics are determined by resistors and capacitors (pins 19, 16 and 13) and inductors connected to the 90 V supply.

The RGB colour channels have separate internal feedback loops. This ensures high signal linearity and marginal signal distortion in spite of output transistor thermal V_{BE} variation.

The **sandcastle pulse** (e.g. from the TDA4850) is used for input clamping, black level clamping and blanking during flyback. During the clamping pulse the input signals are clamped to an internal black level. During blanking and clamping the brightness is set internally to a nominal value.

For **black level stabilization** the signals at the colour feedback inputs (pins 18, 15 and 12) are compared with an internal reference voltage. Input voltages higher than the reference voltage will increase (lower voltages will decrease) the black level voltage during the clamping pulse. The actual CRT cathode voltage is used for feedback. Therefore, variations of the 90 V supply voltage only marginally affect the black level stabilization. A voltage proportional to the black level is stored on internal capacitors.

An integrated colour switch-off facility allows the RGB outputs to be switched to ultra-black for screen protection.

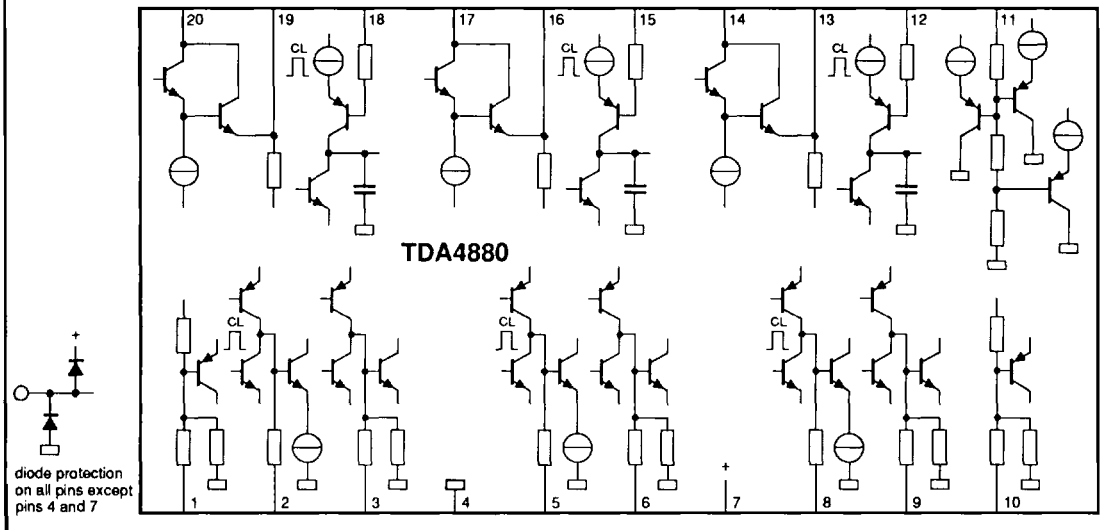

Fig.3 Internal circuits.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134)

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_P	supply voltage (pin 7)	0	8.8	V
V_i	input voltage range (pins 2, 5 and 8)	−0.1	V_P	V
V_{ext}	external DC voltage ranges pins 20, 17 and 14	−0.1	V_P	V
	pins 19,16 and 13	−	−	V
	pins 1, 3, 6, 9 and 10	−0.1	V_P	V
	pin 11	−0.7	$V_P + 0.7$	V
I_M	peak output current (pins 20, 17 and 14)	−	150	mA
T_{stg}	storage temperature range	−25	150	°C
T_{amb}	operating ambient temperature range	0	70	°C
T_j	maximum junction temperature	−	150	°C
P_{tot}	total power dissipation	−	1200	mW

CHARACTERISTICS

V_P = 8.0 V; T_{amb} = 25 °C; all voltages measured to GND (pin 4); unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_P	supply voltage range (pin 7)		7.2	8.0	8.8	V
I_P	supply current (pin 7)		–	40	–	mA
Video signal inputs						
$V_{I(b-w)}$	input amplitude (pins 2, 5 and 8) (black-to-white)		–	0.7	1.0	V
$I_{2,5,8}$	DC current	no clamping	–0.1	–	0.1	μA
		during clamping	± 50	–	–	μA
Brightness control						
V_1	input voltage range		1.0	–	6.0	V
I_1	current		–	–	± 100	μA
ΔV_{bl1}	black level voltage change at nominal gain (pins 19, 16 and 13)	V_1 = 1.0 V; $V_{3,6,9}$ = 6 V	–	–0.1	–	V
		V_1 = 2.25 V; $V_{3,6,9}$ = 6 V	–	0	–	V
		V_1 = 6.0 V; $V_{3,6,9}$ = 6 V	–	0.3	–	V
Contrast control						
V_{10}	input voltage range		1.0	–	6.0	V
I_{10}	current		–	–	± 100	μA
C_v	contrast relative to nominal contrast	V_{10} = 6.0 V; $V_{3,6,9}$ = 6 V	–	3	–	dB
		V_{10} = 4.5 V; $V_{3,6,9}$ = 6 V	–	0	–	dB
		V_{10} = 1.0 V; $V_{3,6,9}$ = 6 V	–	–20	–	dB
Tr	tracking of RGB signals		–	0	0.5	dB
Gain control						
$V_{3,6,9}$	input voltage range		1.0	–	6.0	V
$I_{3,6,9}$	current		–	–	± 100	μA
G_v	gain relative to nominal gain	V_{10} = 4.5 V; $V_{3,6,9}$ = 6 V	–	0	–	dB
		V_{10} = 4.5 V; $V_{3,6,9}$ = 1 V	–	–6	–	dB
Frequency response						
G_{vf}	gain decrease by frequency response at pins 20, 17 and 14	70 MHz	–	–	–3	dB
t_{rO}	rise time at voltage output (pins 19,16 and 13)	10% to 90% amplitude; input rise time = 1 ns	–	5	–	ns

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Voltage outputs (pins 19, 16, 13)						
$V_{O(b-w)}$	signal output voltage (black-to-white value)	at nominal contrast, gain and nominal input signals	–	1.0	–	V
V_{bl}	black level voltage	during clamping	0.5	–	0.7	V
		during switch-off	–	–	0.3	V
S/N	signal to noise ratio	note 1	–	–	44	dB
Current outputs (pins 20, 17 and 14)						
$I_{O(b-w)}$	signal current (black-to-white)		–	50	–	mA
		with peaking (note 2)	–	100	–	mA
THD	total harmonic distortion	output swing = 1 V	–	–	1	%
Feedback input						
V_{int}	internal reference voltage		–	5.8	–	V
$I_{18,15,12}$	output current		–	–	−1	μA
Threshold voltages (note 3)						
V_{11}	threshold voltage for blanking		1.0	1.4	1.7	V
	threshold voltage for clamping		2.6	3.0	3.3	V
	threshold voltage for switch off		4.5	5.0	5.2	V
I_{11}	current		–	–	± 100	μA
t_{w11}	width of clamping pulse		1	–	–	μs

Notes to the characteristics

1. The signal-to-noise ratio is calculated by the formula (frequency range 1 to 70 MHz):

$$\frac{\text{peak-to peak value of the nominal signal output voltage}}{\text{RMS value of the noise output voltage}}$$

2. The external RC combinations at pins 19, 16 and 13 enables peak currents during transients.
3. The internal threshold voltages are derived from an internally stabilized voltage.