Signetics

Linear Products

DESCRIPTION

The TDA4580 is a monolithic integrated circuit which performs video control functions in television receivers with a color difference interface. For example, it operates in conjunction with the multistandard color decoder TDA4555. The required input signals are: luminance and negative color difference - (R-Y) and -(B-Y), and a 3-level sandcastle pulse for control purposes. Analog RGB signals can be inserted from two sources, one of which has full performance adjustment possibilities. RGB output signals are available for driving the video output stages. This circuit provides automatic cut-off control of the picture tube.

FEATURES

- Capacitive coupling of the color difference, luminance, and RGB input signals with black level clamping
- Two sets of analog RGB inputs via fast switch 1 and fast switch 2
- First RGB inputs and fast switch 1 in accordance with peritelevision connector specification
- Saturation, contrast, and brightness control acting on first RGB inputs

ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
28-Pin Plastic DIP, (SOT-117)	0 to 70°C	TDA4580N

TDA4580 Video Control Combination Circuit With Automatic Cut-Off Control

Product Specification

- Brightness control acting on second RGB inputs
- Equal black levels for television and inserted signals
- Clamping, horizontal and vertical blanking, and timing of automatic cut-off, controlled by a 3-level sandcastle pulse
- Automatic cut-off control with compensation for leakage current of the picture tube
- Measuring pulses of cut-off control start immediately after end of vertical part of sandcastle pulse
- Three selectable blanking intervals for PAL, SECAM, and NTSC/PAL-M
- Two switch-on delays for run-in without discoloration
- Adjustable peak drive limiter
- Average beam current limiter
- G-Y and RGB matrix coefficients selectable for PAL/SECAM and NTSC (correction for FCC primaries)
- Bandwidth 10MHz (typ.)
- Emitter-follower outputs for driving the RGB output stages

APPLICATIONS

- Video processing
- TV receivers
- Projection TV

PIN CONFIGURATION



TDA4580

Video Control Combination Circuit With Automatic Cut-Off Control

BLOCK DIAGRAM



TDA4580

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
$V_{CC} = V_{6-24}$	Supply voltage range (Pin 6)	0 to 13.2	v
V _{n - 24}	Voltage range at Pins 2, 4, 7, 9, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 25, 27 to Pin 24 (ground)	0 to V _{CC}	V
V _{8, 11, 28-24} V ₁₀₋₂₄ V ₂₆₋₂₄	Voltage ranges at Pins 8, 11, 28 at Pin 10 at Pin 26	-0.5 to V _{CC} 0 to V _{CC} +0.7 -0.7 to V _{CC} +0.7	v v v
~I ₁ , 3, 5(AV) -I ₁ , 3, 5(M) I _{19(AV)} I ₂₆	Currents at Pins 1, 3, 5 (average) at Pins 1, 3, 5 (peak) at Pin 19 (average) at Pin 26	3 10 5 1	mA mA mA mA
PTOT	Total power dissipation	2	w
T _{STG}	Storage temperature range	-65 to +150	°C
TA	Operating ambient temperature range	0 to +70	°C
θ _{JA}	Thermal resistance from junction to ambient	37	°C /W

DC ELECTRICAL CHARACTERISTICS $V_{CC} = 12V$; $T_A = 25^{\circ}C$; measured in a circuit similar to Figure 2 at nominal settings (saturation, contrast, brightness), no beam current or peak drive limiting; all voltages with respect to Pin 24 (ground), unless otherwise specified.

			LIMITS		
SYMBOL	PARAMETER Min		Тур	Max	UNIT
Supply (Pin 6)				
$V_{\rm CC} = V_{6-24}$	Supply voltage range	10.8		13.2	v
$I_{CC} = I_6$	Supply current		110		mA
Color differen	nce inputs (Pins 17 and 18)				
V _{17 ~ 24} (P - P)	-(R-Y) input signal at Pin 17 (peak-to-peak value)1, 2		1.05		V
V _{18 - 24} (P - P)	-(B-Y) input signal at Pin 18 (peak-to-peak value)1, 2		1.33		v
I _{17, 18}	Input current during scanning			0.3	μA
R17, 18	Input resistance	5			MΩ
V17, 18-24	8-24 Internal DC bias voltage during clamping time		7.5		v
Luminance in	put (Pin 15) ²		·		
V15-24(P-P)	Composite video input signal (VBS) (peak-to-peak value)		0.45		V
I ₁₅	Input current during scanning			0.3	μA
R ₁₅	Input resistance	5			MΩ
V15-24	Internal DC bias voltage during clamping time		7.4		V
Signal switch	1 Input (Pin 11)	· · · · ·		•	
V11-24	Input voltage level for insertion of Y and CD signals			0.4	v
V11-24	RGB1 signals	0.9		3.0	v
R ₁₁	Internal resistor to ground		10		kΩ

TDA4580

Video Control Combination Circuit With Automatic Cut-Off Control

DC ELECTRICAL CHARACTERISTICS (Continued) V_{CC} = 12V; T_A = 25°C; measured in a circuit similar to Figure 2 at

nominal settings (saturation, contrast, brightness), no beam current or peak drive limiting; all voltages with respect to Pin 24 (ground), unless otherwise specified.

		LIMITS			· · · · · · · · · · · · · · · · · · ·
SYMBOL	PARAMETER	Min	Тур	Max	UNIT
RGB1 inputs	(R1 Pin 14, G1 Pin 13, B1 Pin 12) (signals controlled by satu	ration, contr	ast, and brig	ghtness) ²	
V12, 13, 14-24	Input signal (black to white value)		0.7		v
12, 13, 14	Input current during scanning			0.3	μA
R _{12, 13, 14}	Input resistance	5			MΩ
V12, 13, 14 - 24	Internal DC bias voltage during clamping time		8.2		v
RGB/Y, (R - Y	/), (B - Y) — Matrix			.	
Matrixed acco $V_{(R-Y)} = 0.7$ $V_{(B-Y)} = -0.7$ $V_{(Y)} = 0.3$ V	rding to the equations 'V _R -0.59 V _G -0.11 V _B 3 V _R -0.59 V _G +0.89 V _B _R +0.59 V _G +0.11 V _B				
Contrast con	trol input (Pin 19) (contrast control acts on Y and CD signals	or RGB1 si	gnals, respe	ectively) ³	
V ₁₉₋₂₄	Maximum contrast		4		V
V ₁₉₋₂₄	Nominal contrast (6dB below maximum)		3		V
	Attenuation of contrast at $V_{19-24} = 2V$ (related to maximum)		22		dB
-1 ₁₉	Input current at $V_{19-24} = 2$ to $4V$			3	μA
Peak drive lin	niting input (Pin 9) ⁴				
V ₉₋₂₄	Internal DC bias voltage		9		v
R ₉	Input resistance at $V_{9-24} > 9V$		10		kΩ
I ₁₉	Control current into contrast input (Pin 19) during peak drive V1, 2, or $3-24 > V_{9-24}$		20		mA
Average bear	n current limiting input (Pin 25) ⁵				
V _{25 - 24}	Start of contrast reduction at maximum contrast setting		8.5		V
ΔV_{25-24}	Input range for full contrast reduction		1.0		V
R ₂₅	Input resistance at V ₂₅₋₂₄ < 6V		2.2		kΩ
Saturation co	ontrol input (Pin 16) (saturation control acts on CD signals or	RGB1 signa	lls, respectiv	/ely)	
V _{16 - 24}	Maximum saturation		4		V
V ₁₆₋₂₄	Nominal saturation (6dB below maximum)		3		V
	Attenuation of saturation at $V_{16-24} = 1.8V$ (related to maximum at 100kHz)	50	1		dB
I ₁₆	Input current at $V_{16-24} = 1.8$ to 4V			10	μA
Brightness co	ontrol input (Pin 20) ^{6, 7}				
V20-24	Control voltage range	1		3	V
-I ₂₀	Input current at V ₂₀₋₂₄ = 1 to 3V			10	μA
V ₂₀₋₂₄	Control voltage for nominal brightness		2.2		V
	Change of black level in the control range related to the nominal output signal (black/white) for $\Delta V_{20-24} = 1V$		33		%
V20-24	Signal switched off and black level equal to cut-off level	11.5			v

TDA4580

DC ELECTRICAL CHARACTERISTICS (Continued) V_{CC} = 12V; T_A = 25°C; measured in a circuit similar to Figure 2 at nominal settings (saturation, contrast, brightness), no beam current or peak drive limiting; all voltages with respect to Pin 24 (ground),

or peak drive limiting; all voltages with respeunless otherwise specified.

		LIMITS			
SYMBOL	PARAMETER	Min	Тур	Max	UNIT
Y, (R-Y), (B-Y	()/RGB-Matrix ⁸	•	• • • • • • • • • • • • • • • • • • • •		
	PAL matrix ($V_{8-24} = \le 4.5V$)				
	Matrixed according to the equation $V_{(G-Y)} = -0.51V_{(R-Y)} - 0.19V_{(B-Y)}$				
	NTSC matrix ($V_{8-24} = \ge 5.5V$)				
	(Adaption for NTSC-FCC primaries, nominal hue control set on -5°C)				
	$\begin{array}{l} \mbox{Matrixed according to the equation} \\ V(G - \gamma)^{\theta} = -0.43V_{(R - Y)} - 0.11V_{(B - Y)} \\ V(R - Y)^{\theta} = 1.57V_{(R - Y)} - 0.41V_{(B - Y)} \\ VI_{(B - Y)}^{\theta} = V_{(B - Y)} \end{array}$				
RGB2 inputs	(Teletext) (R2 Pin 23, G2 Pin 22, B2 Pin 21) ²				
	(RGB signals controlled by brightness control)				
V21, 22, 23-24	Input signal for 100% output signals (black to white value)		1		v
121, 22, 23	Input current during scanning			0.3	μA
I _{21, 22, 23}	Input resistance	5			MΩ
Signal switch	2 input (Pin 28)				
	Input voltage level for insertion of Y, CD signals or RGB1 signals, respectively				
V ₂₈₋₂₄ V ₂₈₋₂₄	RGB signals from matrix ⁹ RGB2 signals ⁹	0.9		0.4 3.0	v v
R ₂₈₋₂₄	Internal resistor to ground		10		kΩ
Automatic cu see Figure	it-off control input (Pin 26) (Leakage current measuring time a 3; types of ultra-black level — see Figure 1.) ¹⁰	and insertio	n of RGB cu	t-off measur	ing lines —
V _{26 - 24}	Allowed maximum external DC bias voltage	5.5			V
ΔV ₂₆₋₂₄	Voltage difference between cut-off current measurement and leakage current measurement		0.5		v
V1, 3, 5-24	Warm-up test pulse		V9-24		v
V ₂₆₋₂₄	Threshold for warm-up detector		8		v
Storage input	t for leakage current (Pin 27)				
R ₂₇	Internal resistance during leakage current measuring time (current limiting at $I_{27} = 0.2$ mA)		400		Ω
I ₂₇	Input current except during cut-off control cycle			0.5	μA
Storage inpu	ts for automatic cut-off control (Pins 2, 4, 7)				
_{2, 4, 7}	Charge and discharge currents		0.3		mA
1 _{2, 4, 7}	Input currents of storage inputs out of control time			0.1	μA

DC ELECTRICAL CHARACTERISTICS (Continued) $V_{CC} = 12V$; $T_A = 25^{\circ}C$; measured in a circuit similar to Figure 2 at

 V_{CC} = 12V; T_A = 25°C; measured in a circuit similar to Figure 2 at nominal settings (saturation, contrast, brightness), no beam current or peak drive limiting; all voltages with respect to Pin 24 (ground), unless otherwise specified.

	BOL PARAMETER	LIMITS			
SYMBOL		Min	Тур	Max	UNIT
Switch input	for PAL/NTSC matrix and vertical blanking time (Pin 8) ¹¹				
	Switching voltage input for PAL matrix and vertical blanking				
V-	period of		0	0.5	V
V8-24 Ve 24	22 lines	1.5	2	2.5	v
V ₈₋₂₄	18 lines	3.5	4	4.5	v
V ₈₋₂₄	NTSC matrix and vertical blanking period of 18 lines	5.5	6	12	V
l ₈	Input current			50	μA
Sandcastle p	ulse detector (Pin 10) ¹²				
	The following amplitudes are required for separating the various pulses:				
V ₁₀₋₂₄	horizontal and vertical blanking pulses	2.0	2.5	3.0	v
V10-24	horizontal pulses for counter logic	4.0	4.5	5.0	v
V10-24	clamping pulses	7.5			V
to	delay of leading edge of clamping pulse		1		μs
-l ₁₀	Input current at V ₁₀₋₂₄ = 0V			100	μA
Outputs for p	positive RGB signals (R0 Pin 1, G0 Pin 3, B0 Pin 5) ¹³			· · · · · · · · · · · · · · · · · · ·	
V _{1, 3, 5-24}	Nominal signal amplitude (black/white)	-	3		V
	Spreads between channels			10	%
V1, 3, 5-24	Maximum signal amplitude (black/white)	4			V
l _{1, 3, 5}	Internal current source		3		mA
R _{1, 3, 5}	Output resistance		160	220	Ω
V1, 3, 5-24	Minimum output voltage		1		V
V1, 3, 5-24	Maximum output voltage		10		V
	Horizontal and vertical blanking to ultra-black level 2, related to nominal signal black level in percentage of nominal signal amplitude	45	55		%
	Vertical blanking to ultra-black level 1, related to cut-off measuring level in percentage of nominal signal amplitude	25	35		%
	Recommendation: Range for cut-off measuring level 1.5 to 5.0V; nominal value at $3V^{14}$				
Gain data ¹⁵					
d	Frequency response of Y path (0 to 8MHz) Pins 1, 3, and 5 to Pin 15			3	dB
d	Frequency response of CD path (0 to 8MHz) Pin 1 to Pin 17 = Pin 5 to Pin 18			3	dB
d	Frequency response of RGB1 path (0 to 8MHz) Pin 1 to Pin 14 = Pin 3 to Pin 13 = Pin 5 to Pin 12			3	dB
d	Frequency response of RGB2 path (0 to 10MHz) Pin 1 to Pin 23 = Pin 3 to Pin 22 = Pin 5 to Pin 21			3	dB

TDA4580

NOTES:

- 1. The value of the color difference input signals, -(B-Y) and -(R-Y), is given for saturated color bar with 75% of maximum amplitude.
- 2. Capacitive coupled to a low ohmic source; recommended value 600 Ω (maximum).
- 3. At Pin 19 for $V_{19-24} \leq 2.0V$, no further decrease of contrast is possible.
- 4. The peak drive limiting of output signals is achieved by contrast reduction. The limiting level of the output signals is equal to the voltage V₉₋₂₄, adjustable in the range 5 to 11V. After exceeding the adjusted limiting level at peak drive, limiter will not be active during the first line.
- aujustable in the targe 5 to 11. Atter exceeding the aujusted mining level at peak drive, immer win not be active during the mist mise. 5. The average beam current limiting acts on contrast and at minimum contrast on brightness (the external contrast voltage at Pin 19 is not affected).
- So the average beam contrast the hand gots of contrast and a 0.37 (\approx -10% of nominal signal amplitude below the measuring level.
- 7. The internal control voltage can never be more positive than 0.7V above the internal contrast voltage.

8. Matrix equation

V _(R-Y) , V _(B-Y)	: output of NTSC decoder of PAL type demodulating axis and amplitudes
$V_{(G-Y)}^{*}$, $V_{(R-Y)}^{*}$, $V_{(B-Y)}^{*}$: for NTSC modified CD signals; equivalent to demodulation with the following axes
	and amplification factors:
(B - Y)* demodulator axis	0°
(R - Y)* demodulator axis	115° (PAL 90°)
(R - Y)* amplification factor	1.97 (PAL 1.14)
(B – Y)* amplification factor	2.03 (PAL 2.03)

 $V_{(G-Y)}^{*} = -0.27V_{(R-Y)}^{*} - 0.22V_{(B-Y)}^{*}$

- 9. During clamping time, in each channel the black level of the inserted signal is clamped on the black level of the internal signal behind the matrix (dependent on brightness control).
- 10. During warm-up time of the picture tube, the RGB outputs (Pins 1, 3, and 5) are blanked to minimum output voltage. An inserted white pulse during the vertical flyback is used for beam current detection. If the beam current exceeds the threshold of the warm-up detector at Pin 26, the cut-off current control starts operating, but the video signal is still blanked. After run-in of the cut-off current control loop, the video signal will be released. The first measuring pulse occurs in the first complete line after the end of the vertical part of the sandcastle pulse. The absolute minimum vertical part must contain 9 line-pulses. The cycle time of the counter is 63 lines. When the vertical pulse is longer than 61 lines, the IC is reset to the switch-on condition. In this event the video signal is blanked and the RGB outputs are blanked to minimum output voltage as during warm-up time. During leakage current measurement, all three channels are blanked to ultra-black level 1. With the measuring level only in the controlled channel, the other two channels are blanked to ultra-black level 1. The brightness control is disabled from line 4 to the end of the last measuring line (see Figure 1).

With the most adverse conditions (maximum brightness and minimum black level 2) the blanking level is located 30% of nominal signal amplitude below the cut-off measuring level.

- 11. The given blanking times are valid for the vertical part of the sandcastle pulse of 9 to 15 lines. If the vertical part is longer and the cut-off lines are outside the vertical blanking period of 18, 22, or 25 lines, respectively, the blanking of the signal ends with the end of the last of the three cut-off measuring pulses as shown in Figure 3.
- 12. The sandcastle pulse is compared with three internal thresholds (proportional to V_{CC}) to separate the various pulses. The internal pulses are generated when the input pulse at Pin 10 exceeds the thresholds. The thresholds are for:
 - Horizontal and vertical blanking
 V₁₀₋₂₄ = 1.5V
 - Horizontal pulse $V_{10-24} = 3.5V$
 - Clamping pulse
 V₁₀₋₂₄ = 7.0V
- 13. The outputs at Pins 1, 3, and 5 are emitter-followers with current sources and emitter protection resistors.
- 14. The value of the cut-off control range for the positive RGB output signals is given for a nominal output signal. If the signal amplitude is reduced, the cut-off range can be increased.
- 15. The gain data is given for a nominal setting of the contrast and saturation controls, measured without load at the RGB outputs (Pins 1, 3, and 5).









TDA4580

TDA4580

Video Control Combination Circuit With Automatic Cut-Off Control

