National Semiconductor

TBA560C Luminance and Chrominance Control Combination

General Description

The TBA560C is an integrated circuit for processing and controlling luminance and chrominance signals in PAL TV receivers.

The luminance amplifier comprises:

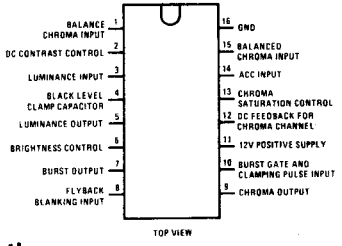
- DC contrast control
- Brightness control
- Black level clamping
- Blanking of flyback
- Input matched to the luminance delay line

The chrominance amplifier comprises:

- Gain-controlled amplifier
- DC chroma gain control tracked with contrast control
- Separate dc saturation control
- PAL delay line driver
- Burst gate
- Color killer
- Chroma signal flyback blanking

Connection Diagram

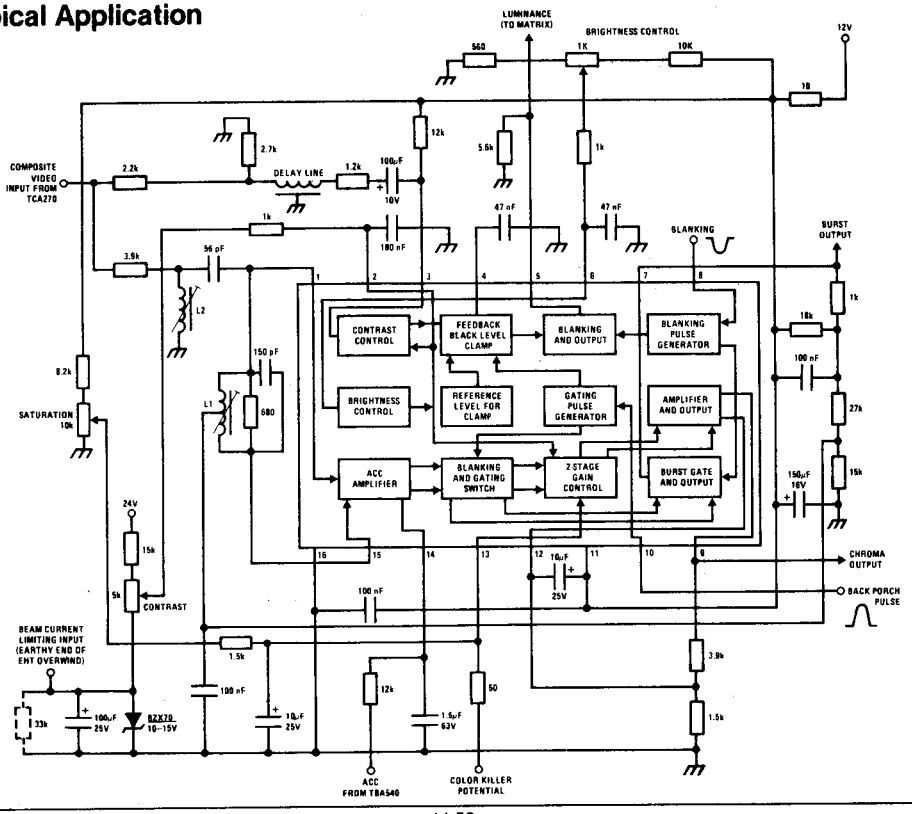
Dual-In-Line Package



Dual-In-Line Package, Order Number TBA560C
See NS Package N16A

Quad-In-Line Package, Order Number TBA560CQ
See NS Package N16C

Typical Application



Absolute Maximum Ratings (Note 1)

V11-16	13.2V	I_Q	−10 mA
V8-16 Min.	−5V	Continuous Total Power Dissipation	550 mW
V10-16 Min.	−5V	Operating Free Air Temperature Range	−20°C to +60°C
V12-16	−5V to +6V	Storage Temperature Range	−65°C to +150°C
V13-16	−3V to +6.5V	Lead Temperature (Soldering, 10 seconds)	300°C
V14-16 Min.	−5V		

Electrical Characteristics with V11-16 = 12V, T_A = 25°C (as measured in typical application circuit)

	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V1-15	Chrominance Input Signal Range (Value of Color Bars With 75% Saturation)		4		80	mVp-p
I_3	Luminance Input Current Black to White			0.5	1.5	mAp-p
V2-16	Contrast Control Characteristic	Full Gain		5.6		V
		6 dB Attenuation		3.7		V
		20 dB Attenuation (Note 2)		2.0		V
V6-16	Brightness Control Voltage for Black Level of 1.5V at Pin 5	(Note 3)		1.3		V
V8-16	Flyback Blanking Pulses					
V8-16	For 0V Blanking Level at Pin 5		0	−0.5	−1	Vp-p
	For 1.5V Blanking Level at Pin 5		−2	−2.5	−3	Vp-p
V13-16	Saturation Control Characteristic	Full Gain		6.2		V
		6 dB Attenuation		4.4		V
		20 dB Attenuation (Note 2)		2.7		V
I_{10}	Burst Gating Pulse		0.05		1	mAp-p
V13-16	Color Killer		0.5		1	V
	Automatic Chrominance Control					
V14-16	Voltage for Maximum Gain			1.2		V
	Voltage for Minimum Gain			0.5		V
	Gain Reduction			26		dB
	Input Resistance		50			kΩ
V5-16	Luminance Output Voltage (Black-White) at Nominal Contrast and Input Current as above	(Note 2)		1	3	Vp-p
	Black Level Shift Due to Changes of Contrast and Video Content at Constant Brightness Setting				100	mV
V7-16	Burst Output			1		Vp-p
V9-16	Chrominance Output at Nominal Contrast and Saturation	(Note 2)		1		Vp-p
	3 dB Bandwidth of Chrominance and Luminance Amplifier			5		MHz
	Matching of Luminance to Chrominance Ratio at 10 dB Contrast Control				2	dB

Note 1: V2-16 and V13-16 must always be lower than V11-16.
Note 2: Typical or nominal contrast or saturation = maximum value −6 dB. Thus the control is +6 to −14 dB on the nominal.
Note 3: When V6-16 is increased above 1.7V the black level of the output signal remains at 2.7V.

Pin Function Description

1. Balanced chroma signal input (in conjunction with pin 15). This is derived from the chroma signal bandpass filter, designed to provide a push-pull input. An input signal amplitude of at least 4 mVp-p is required between pins 1 and 15. Both pins require a dc potential of approximately +3.0V. This is derived as a common mode signal from a network connected to pin 7 (burst output). In this way dc feedback is provided over the burst channel to stabilize its operation. All figures for the chrominance signal are based on a color bar signal with 75% saturation; i.e., burst-to-chroma ratio of input signal is 1:2.

2. DC contrast control. With +3.7V on this pin, the gain in the luminance channel is such that a 0.5 mA black-to-white input signal to pin 3 gives a luminance output signal amplitude on pin 5 of 1V black-to-white. A variation of voltage on pin 2 between +5.6V and +2V gives a corresponding gain variation of +6 to > -14 dB. A similar variation in gain in the chroma channel occurs in order to provide the correct tracking between the two signals. Beam current limiting can be applied via the contrast control network as shown in the peripheral circuit, when a separate overwind is available on the line output transformer.

3. Luminance signal input. This terminal has a very low input impedance and acts as a current sink. The luminance signal from the delay line is fed via a series terminating resistor and a dc blocking capacitor and requires to be about 0.5 mAp-p amplitude. A dc bias current is required via a 12 kΩ resistor to the +12V line.

4. Charge storage capacitor for black level clamp.

5. Luminance signal output. An emitter follower provides a low impedance output signal of 1V black-to-white amplitude at nominal contrast setting having a nominal black level in the range 0 to +2.7V. An external emitter load resistor is required, not less than 1 kΩ. If a greater luminance output is required than 1V, with normal control settings, the input current swing at pin 3 should be increased in proportion.

6. Brightness control. Over the range of potential +0.9 to +1.7V the black level of the luminance output signal (pin 5) is increased from 0 to +2.7V. The output signal black level remains at +2.7V when the potential on pin 6 is increased above +1.7V.

7. Burst output. A 1 Vp-p burst (controlled by the ACC system) is produced here. Also, to achieve good dc stability by negative feedback in the burst channel the dc potential at this pin is fed back to pins1 and 15 via the chroma input transformer.

8. Flyback blanking input waveform. Negative-going horizontal and vertical blanking pulses may be applied here. If rectangular blanking pulses of not greater than −1V negative excursion, or dc coupled pulses of similar amplitude whose negative excursion is at zero volts dc are applied, the signal level at the luminance output (pin 5) during blanking will be 0V. However, if the blanking pulses applied to pin 8 have an amplitude of −2 to −3V the signal level at the luminance output during blanking will be +1.5V. The negative pulse amplitude should not exceed −5V.

9. Chroma signal output. With a 1 Vp-p burst output signal (pin 7) and at nominal contrast and saturation setting (pins 2 and 13) the chroma signal output amplitude is 1 Vp-p. An external network is required which provides dc negative feedback in the chroma channel via pin 12.

10. Burst gating and clamping pulse input. A positive pulse of not less than 50μA is required on this pin to provide gating in the burst channel and luminance channel black-level clamp circuit. The timing and width of this current pulse should be such that no appreciable encroachment occurs into the sync pulse or picture line periods during normal operation of the receiver.

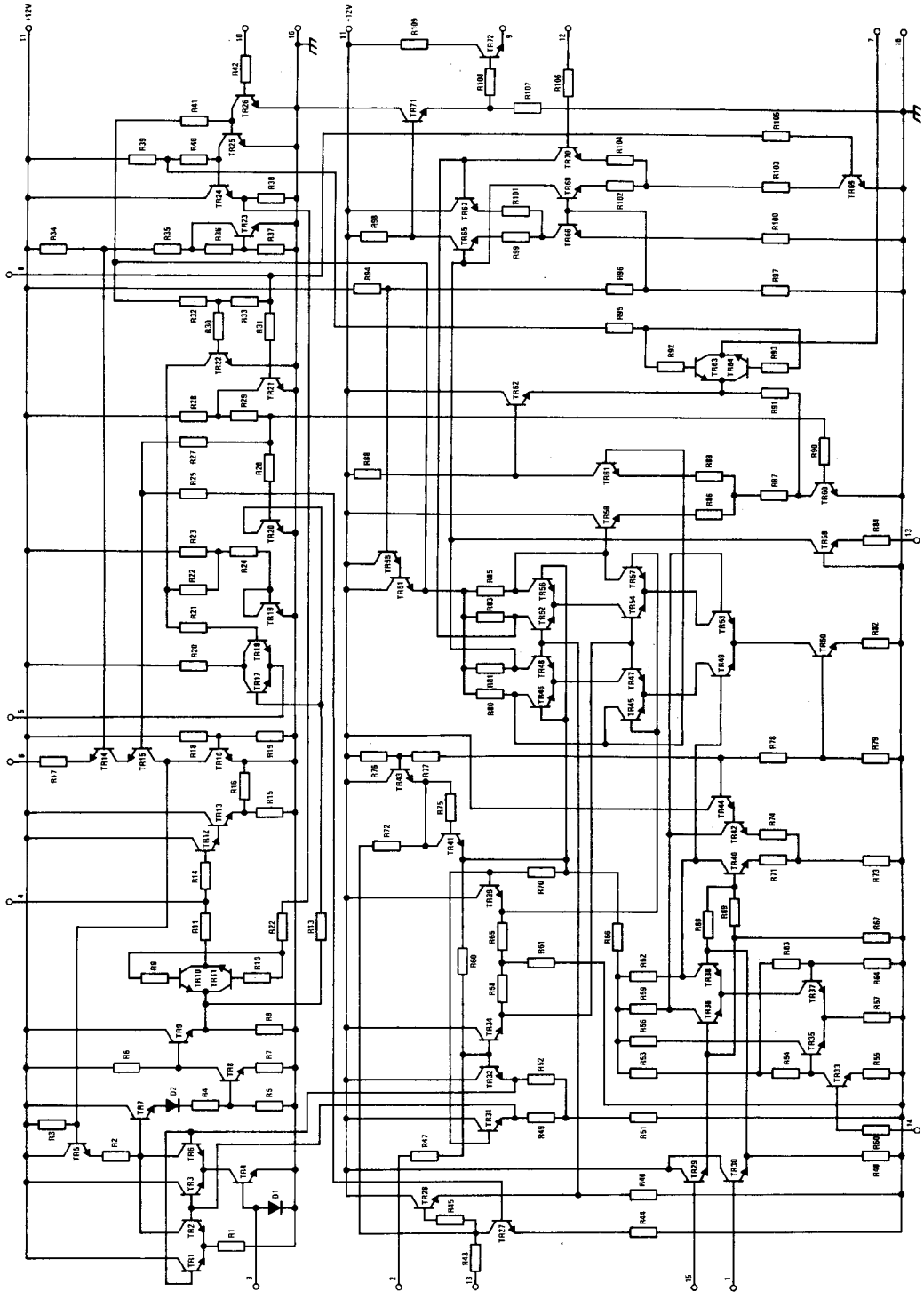
11. +12V LT supply. Correct operation occurs within the range 10.8 to 13.2V. All signal and control levels have a linear dependency on supply voltage but, in any given receiver design this range may be restricted due to considerations of tracking between the power supply variations and picture contrast and chroma levels. The power dissipation must not exceed 550 mW at 60°C ambient temperature.

12. DC feedback for chroma channel (see pin 9).

13. Chroma saturation control. A control range of +6 to > -14 dB is provided over a range of dc potential on pin 13 from 6.2 to 2.7V. Color killing is also achieved at this terminal by reducing the dc potential to less than +1V, e.g., from the TBA540 color killer output terminal. The minimum "kill factor" is 40 dB.

14. ACC input. A negative-going potential gives an ACC range of about 26 dB starting at +1.2V. From 1V to 800 mV the steepest part of the characteristic occurs, but a small amount of gain reduction also occurs from 800 mV to 500 mV. The input resistance is at least 50 kΩ.

15. Chroma signal input (see pin 1).

16. Negative supply, 0V (Earth).

Schematic Diagram