

# TBA560C ✓

## LUMINANCE AND CHROMINANCE CONTROL COMBINATION

### FAIRCHILD LINEAR INTEGRATED CIRCUIT

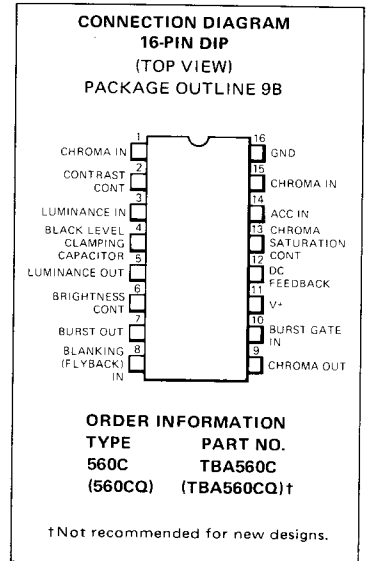
**GENERAL DESCRIPTION** — The TBA560C is a monolithic integrated circuit used in the decoding system of color television receivers. It is constructed on a single silicon chip using the Fairchild Planar\* process. The circuit consists of a luminance and a chroma amplifier. The luminance amplifier input is matched to the delay line. DC contrast, brightness, black level clamping, blanking, and beam current limiting functions are provided by the luminance amplifier portion of the circuit. The chroma amplifier performs functions such as gain controlled amplification, chroma gain control tracked with contrast control, separate saturation control, PAL delay line driver, burst gating and color killer.

- DC CONTRAST CONTROL
- DC BRIGHTNESS CONTROL
- BLACK LEVEL CLAMPING
- BEAM CURRENT LIMITING
- COLOR KILLER
- PAL DELAY LINE DRIVER
- CHROMA GAIN/CONTRAST TRACKING

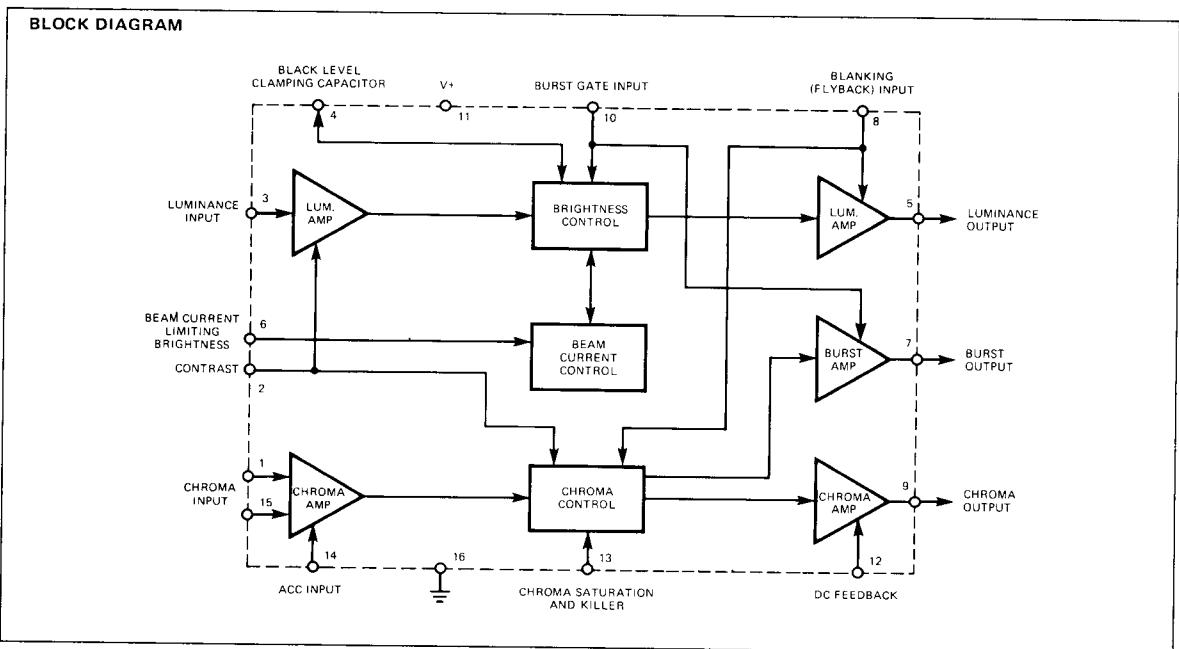
**ABSOLUTE MAXIMUM RATINGS** (Cont'd on Page 2)

Supply Voltage (Note 1)  
 Total Power Dissipation (Note 1)  
 Storage Temperature  
 Operating Ambient Temperature  
 Pin Temperature (Soldering, 10 s)

13 V  
 510 mW  
 -55 to +125°C  
 0 to +60°C  
 260°C



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Notes on following page.

\*Planar is a patented Fairchild process.

**ABSOLUTE MAXIMUM RATINGS**(Cont'd)

**Voltages**

V <sub>1 - 16</sub>	0 to +5.0 V	V <sub>10 - 16</sub>	-5.0 V
V <sub>2 - 16</sub>	0 to +12 V (Note 2)	V <sub>12 - 16</sub>	-5.0 to +6.0 V
V <sub>4 - 16</sub>	0 to +6.0 V	V <sub>13 - 16</sub>	-3.0 to +6.5 V (Note 2)
V <sub>6 - 16</sub>	0 to +3.0 V	V <sub>14 - 16</sub>	-5.0 V
V <sub>8 - 16</sub>	-5.0 to +5.0 V	V <sub>15 - 16</sub>	0 to +5.0 V

**Currents** (Positive when flowing into the integrated circuit)

I <sub>1</sub>	0 to +1.0 mA	I <sub>9</sub>	-10 to 0 mA
I <sub>3</sub>	-1.0 to +3.0 mA	I <sub>10</sub>	+3.0 mA
I <sub>5</sub>	-5.0 to 0 mA	I <sub>14</sub>	+1.0 mA
I <sub>6</sub>	-1.0 to +1.0 mA	I <sub>15</sub>	0 to +1.0 mA
I <sub>7</sub>	-3.0 to +2.0 mA		

**ELECTRICAL CHARACTERISTICS:** T<sub>A</sub> = 25°C, V<sub>11 - 16</sub> = 12V, as shown in Test Circuit, unless otherwise specified.

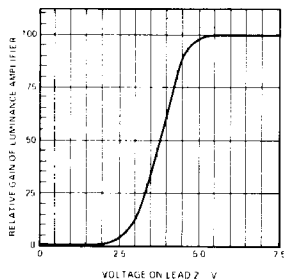
CHARACTERISTICS	CONDITIONS	MIN	TYP	MAX	UNITS
Supply Current	I <sub>11</sub>		30		mA
<b>Required Input Signals</b>					
Chrominance Input Signal (Peak-to-Peak Value)	V <sub>1 - 15</sub> (p-p)		4 to 80		mV
Luminance Input Current (Black to White Value)	I <sub>3</sub> (p-p)		1.5		mA
Contrast Control Voltage Range (for 20 dB of Control)	V <sub>2 - 16</sub>	See Typical Performance Curves			
Brightness Control Voltage (Note 3)	V <sub>6 - 16</sub>	See Typical Performance Curves			
Saturation Control Voltage Range (for 20 dB of Control)	V <sub>13 - 16</sub>	See Typical Performance Curves			
Burst Keying Pulse (Positive) (Peak-to-Peak Value)	I <sub>10</sub> (p-p)	0.05	1.0		mA
Flyback Blanking Pulses (Negative) (Peak-to-Peak Value)					
for 0 V Blanking Level at Lead 5	V <sub>8 - 16</sub> (p-p)		-0.5		V
for 1.5 V Blanking Level at Lead 5	V <sub>8 - 16</sub> (p-p)		-2.5		V
Color Killer	V <sub>13 - 16</sub>			1.0	V
Automatic Chrominance Control Threshold (Note 4)	V <sub>14 - 16</sub>		1.2		V
<b>Obtainable Output Signals</b>					
Luminance Output Voltage at Nominal Contrast (Peak-to-Peak Value)	V <sub>5 - 16</sub> (p-p)	Note 5	3.0		V
Burst Signal (Peak-to-Peak Value)	V <sub>7 - 16</sub> (p-p)	Note 6	1.0		V
Chrominance Signal at Nominal Contrast & Saturation (Peak-to-Peak Value)	V <sub>9 - 16</sub> (p-p)	Note 5	1.0		V
3.0 dB Bandwidth of Chrominance and Luminance Amplifier			5.0		MHz
Change of Ratio, Luminance to Chrominance Signals at 10 dB Contrast Control			2.0		dB

**NOTES:**

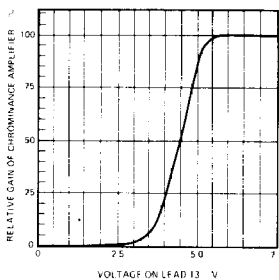
1. Permissible while tubes are heating up: V<sub>11 - 16</sub> (max) 16 V and P<sub>tot</sub> (max) 700 mW.
2. V<sub>2 - 16</sub> and V<sub>13 - 16</sub> must always be lower than V<sub>11 - 16</sub>.
3. When V<sub>6 - 16</sub> is increased above 1.7 V the black level of the output signal remains at 2.7 V.
4. A negative going potential provides a 26 dB ACC range with negligible signal distortion. Maximum gain reduction is obtained at an input voltage of 500 mV typical.
5. Nominal setting: maximum contrast and/or saturation minus 6.0 dB.
6. Burst signal is kept constant at 1.0 V peak-to-peak by automatic gain control (AGC Circuit).

**TYPICAL PERFORMANCE CURVES**

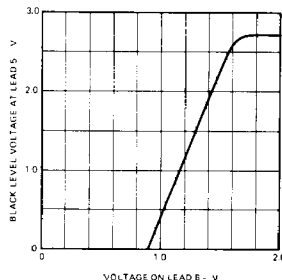
**CONTRAST CONTROL OF LUMINANCE AMPLIFIER**



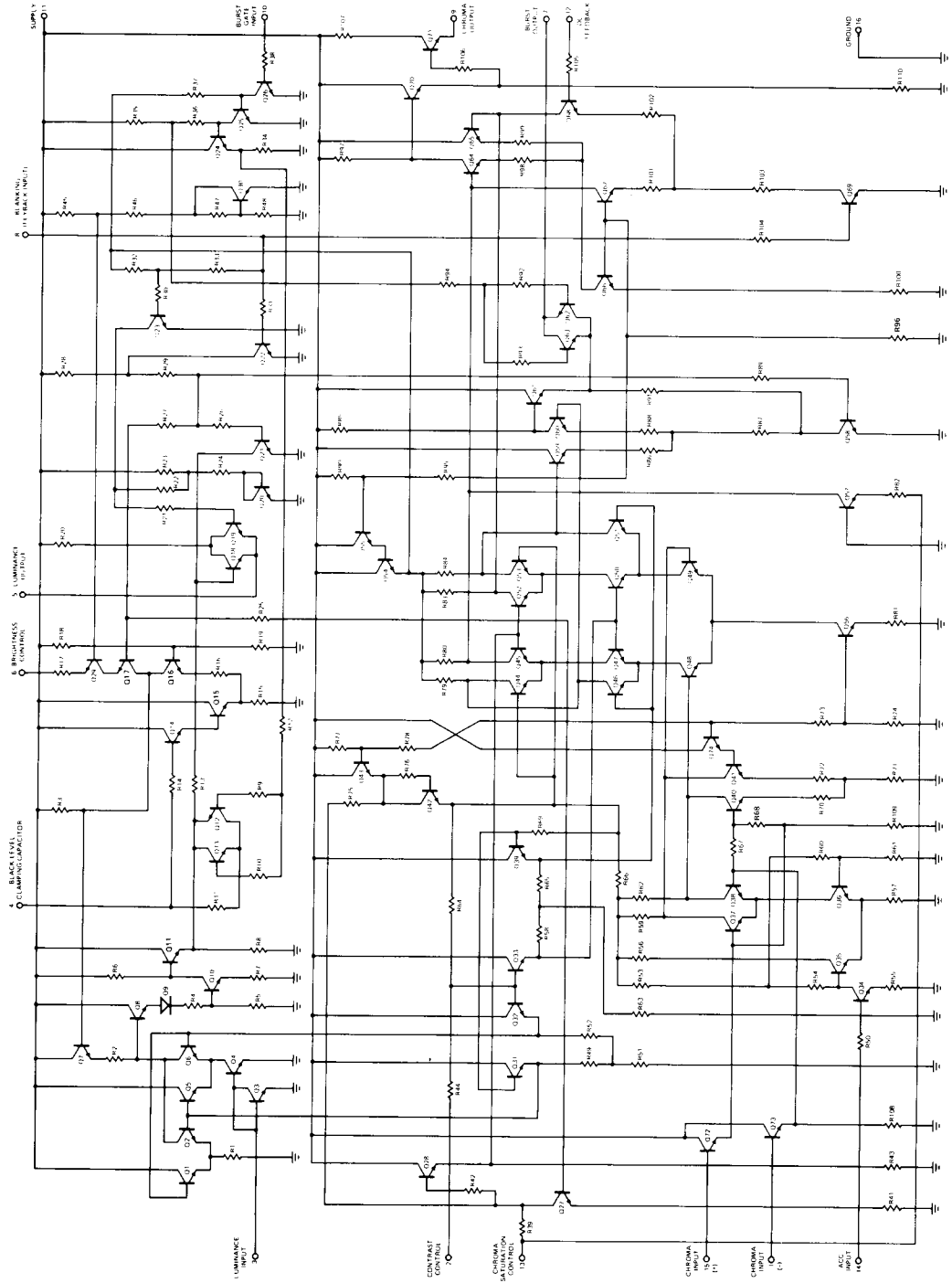
**SATURATION OF CHROMINANCE AMPLIFIER**



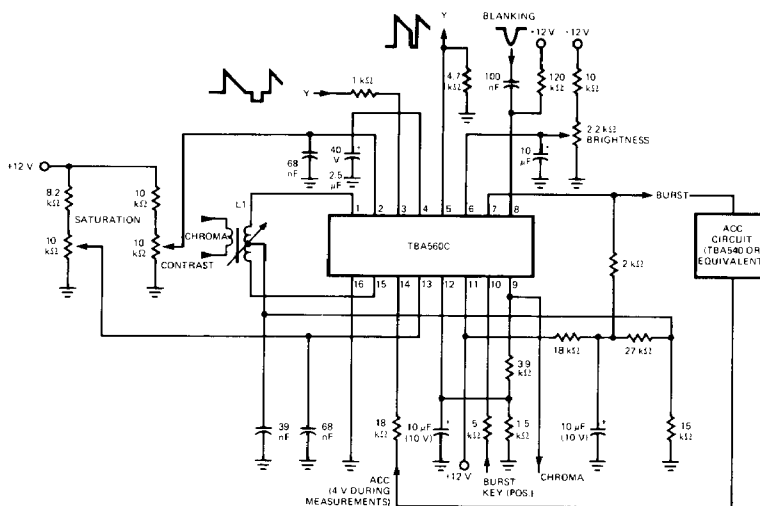
**CONTROL OF BLACK LEVEL AT OUTPUT LUMINANCE AMPLIFIER**



EQUIVALENT CIRCUIT - TBA560C



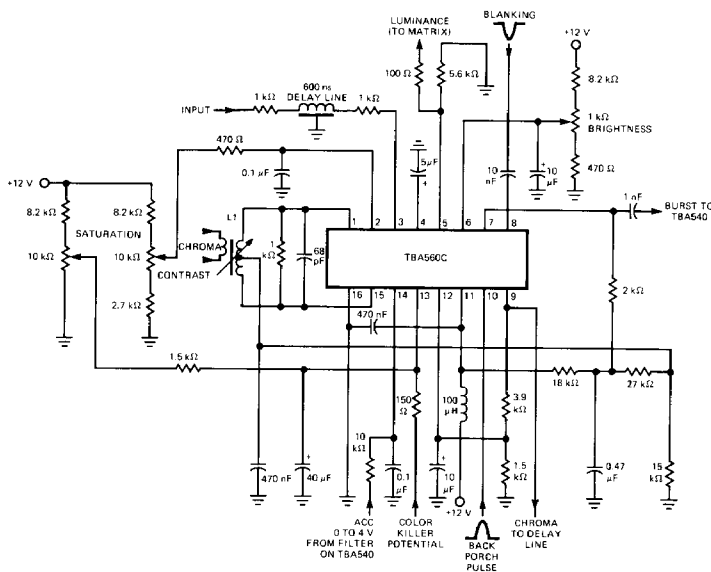
TEST CIRCUIT



APPLICATION INFORMATION

PIN NAMES

- |                                 |   |
|---------------------------------|---|
| 1. Balanced Chroma Signal Input | 9. Chroma Signal Output                 |
| 2. Contrast Control             | 10. Burst Gate and Clamping Pulse Input |
| 3. Luminance Signal Input       | 11. Supply Voltage (12 V)               |
| 4. Black Level Clamp Capacitor  | 12. DC Feedback for Chroma Channel      |
| 5. Luminance Signal Output      | 13. Chroma Saturation Control           |
| 6. Brightness Control           | 14. ACC Input                           |
| 7. Burst Output                 | 15. Chroma Signal Input                 |
| 8. Flyback Blanking Input       | 16. Ground (Negative Supply)            |



Application diagram for operation in combination with the TBA540.

## APPLICATION INFORMATION (Cont'd)

The function is quoted against the corresponding pin number.

1. **Balanced Chroma Signal Input** (in conjunction with lead 15)  
This is derived from the chroma signal bandpass filter, designed to provide the balanced input. A differential input signal amplitude of at least 4 mV peak-to-peak is required on leads 1 and 15. Both leads require a dc potential of approximately +3.0 V. This is derived as a common-mode signal from a network connected to lead 7 (burst output). In this way, dc feedback is provided over the burst channel to stabilize its operation.  
All figures for the chrominance signals 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 +3.7 V on this lead, the gain in the luminance channel is such that a 1.5 mA peak-to-peak input signal to lead 3 gives a luminance output signal amplitude on lead 5 of 3 V black to white. A variation of voltage on lead 2 between +6 V and +2 V 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.
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 must have about 1.5 mA black to white amplitude.
4. **Charge Storage Capacitor for Black Level Clamp**  
Brightness control can also be achieved on this lead by inserting a negative going line flyback pulse, clipped by a diode to be rectangular, across a resistor of approximately 47  $\Omega$  in series with the storage capacitor (5.0  $\mu$ F). Variation of the amplitude of this pulse shifts the black level of the clamped luminance signal and thus controls the picture brightness.
5. **Luminance Signal Output**  
An emitter follower provides a low impedance output signal of 3 V black to white amplitude at nominal contrast setting having a black level in the range 0 to +3 V. An external emitter load resistor is required, greater than 1 k $\Omega$ .  
Black level shift at contrast control is typically in the range of  $\pm 10$  mV if the luminance input current during black level is about 0.75 mA. When this current has a different value a larger black level shift has to be taken into account. If the input current during black level differs 1 mA from the nominal value of 0.75 mA, the black level shift will be about 100 mV over the complete contrast control range. For smaller differences of the input current, the black level shift will be correspondingly smaller.  
Black level shift with video signal content occurs only when the input signal is ac coupled. The value depends on the drive current amplitude and can be calculated from the figures given above (for maximum contrast; for a lower contrast setting the variation is correspondingly smaller).  
Black level shift over an ambient temperature variation of 30°C is typically -140 mV.
6. **The DC Level of the Luminance Output Signal May be Controlled by the DC Potential Applied to this Lead.**  
Over the range of potential +0.9 to +1.7 V, the black level of the luminance output signal (lead 5) is increased from 0 to +2.7 V. The output signal black level remains at +2.7 V when the potential on lead 6 is increased above +1.7 V.
7. **Burst Output**  
A 1 V peak-to-peak burst (kept constant 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 lead is fed back to leads 1 and 15 via the chroma input transformer. When limiting occurs, the burst amplitude is typically 3.0 V.
8. **Flyback Blanking Input Waveform**  
Negative going horizontal and vertical blanking pulses may be applied here. If rectangular blanking pulses of less than -1 V negative excursion are applied, the signal level at the luminance output (lead 5) during blanking will be 0 V. However, if the blanking pulses applied to lead 8 have an amplitude of -2 to -3 V, the signal level at the luminance output during blanking will be +1.5 V.
9. **Chroma Signal Output**  
With a 1 V peak-to-peak burst output signal (lead 7) and at nominal contrast and saturation setting (leads 2 and 13), the chroma signal output amplitude is 1 V peak-to-peak. An external dc network is required which provides negative feedback in the chroma channel via lead 12.
10. **Burst Gating and Clamping Pulse Input**  
A positive pulse of minimum 50  $\mu$ A is required on this lead 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. **+12 V Power Supply**  
Correct operation occurs within the range 10 to 13 V. 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 510 mW at 60°C ambient temperature.
12. **DC Feedback for Chroma Channel** (See lead 9)
13. **Chroma Saturation Control**  
A control range of +6 to > -14 dB is provided over a range of dc potential on lead 13 from +2.7 to +6.2 V. Color killing is also done at this terminal by reducing the dc potential to less than +1 V, e.g. from the TBA540 color killer output terminal. The kill factor is min 40 dB.
14. **ACC Input**  
A negative going potential gives a 26 dB range of ACC starting at +1.2 V and giving maximum gain reduction at an input voltage of typically 500 mV.
15. **Chroma Signal Input** (See lead 1)
16. **Negative Supply** (Ground)