TBA530

RGB MATRIX PREAMPLIFIER

FAIRCHILD LINEAR INTEGRATED CIRCUITS

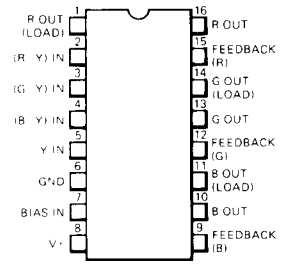
4

GENERAL DESCRIPTION – The TBA530 is an integrated circuit for color T.V. receivers incorporating a matrix preamplifier for RGB cathode or grid drive of the picture tube without clamping circuits. The chip layout has been designed to insure tight thermal coupling between all the transistors in each channel to minimize and equalize thermal drifts between channels.

This device is constructed on a single silicon chip using the Fairchild Planar* epitaxial process and is designed to be driven from the TBA520 or TBA990 synchronous demodulators.

- **THREE MATCHED CHANNELS FOR MATRIXING**
- **MATCHED FREQUENCY RESPONSE**
- **MATCHED TEMPERATURE STABILITY**
- **DIRECT DRIVE OF RGB OUTPUT TRANSISTORS WHEN USING TBA520 OR TBA990**
- **RGB DRIVE WITH OR WITHOUT CLAMPING**

CONNECTION DIAGRAM
16-PIN DIP
(TOP VIEW)
PACKAGE OUTLINE 9B



ORDER INFORMATION

TYPE	PART NO.
530	TBA530
530Q	TBA530Q†

†Not Recommended for New Designs.

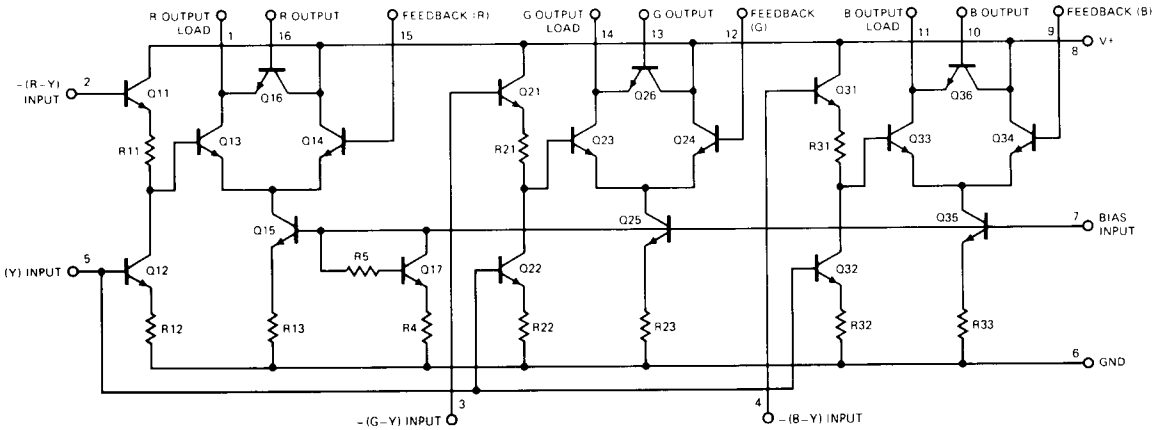
ABSOLUTE MAXIMUM RATINGS

Supply Voltage	13.2 V
Supply Currents (I_1, I_{11}, I_{14})	10 mA
Supply Currents (I_{10}, I_{13}, I_{16}) (Note 1)	50 mA
Total Power Dissipation (Note 1)	400 mW
Storage Temperature	−55°C to +125°C
Operating Ambient Temperature	−20°C to +60°C
Pin Temperature (Soldering, 10 s)	260°C

NOTE:

1. In case of breakdown in the output transistors, 50 mA MAX is permitted from pins 10, 13 and 16 each to pin 8. P_D is then 500 mW MAX.

EQUIVALENT CIRCUIT



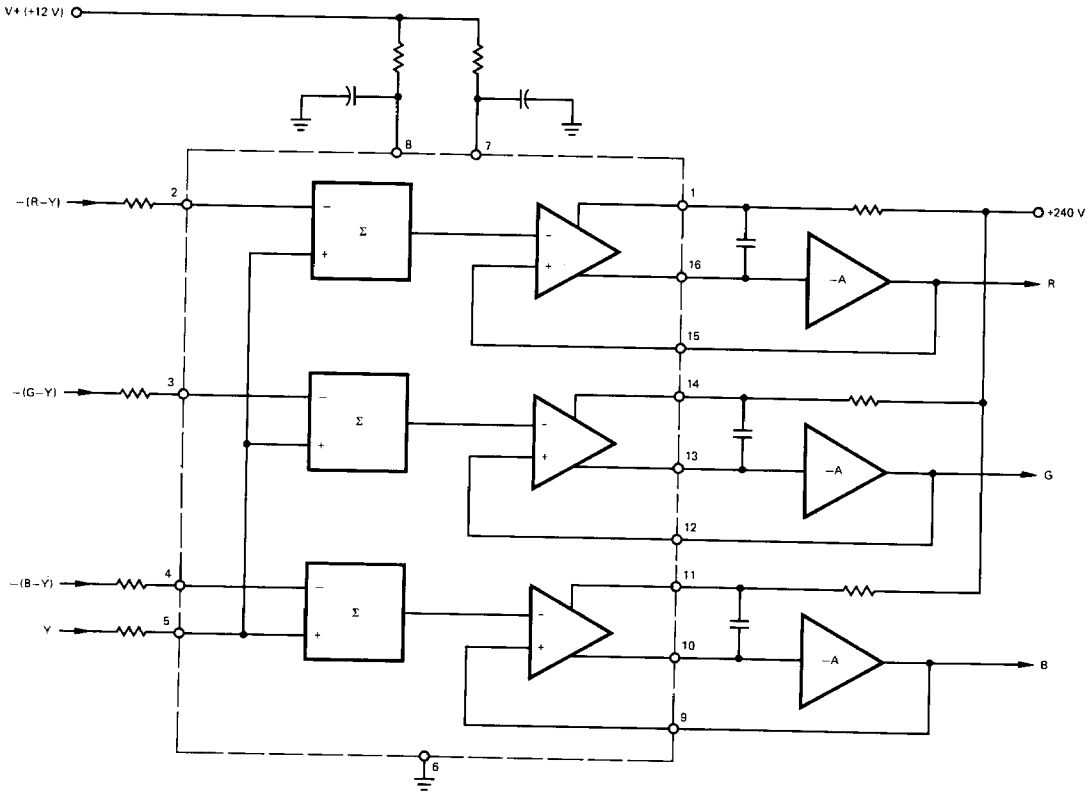
*Planar is a patented Fairchild process.

ELECTRICAL CHARACTERISTICS: $T_A = 25°C$, $V_B = 12V$, see application circuit.
Black level settings: $V_{R-Y} = V_{G-Y} = V_{B-Y} = 7.5$ V, $V_Y = 1.5$ V

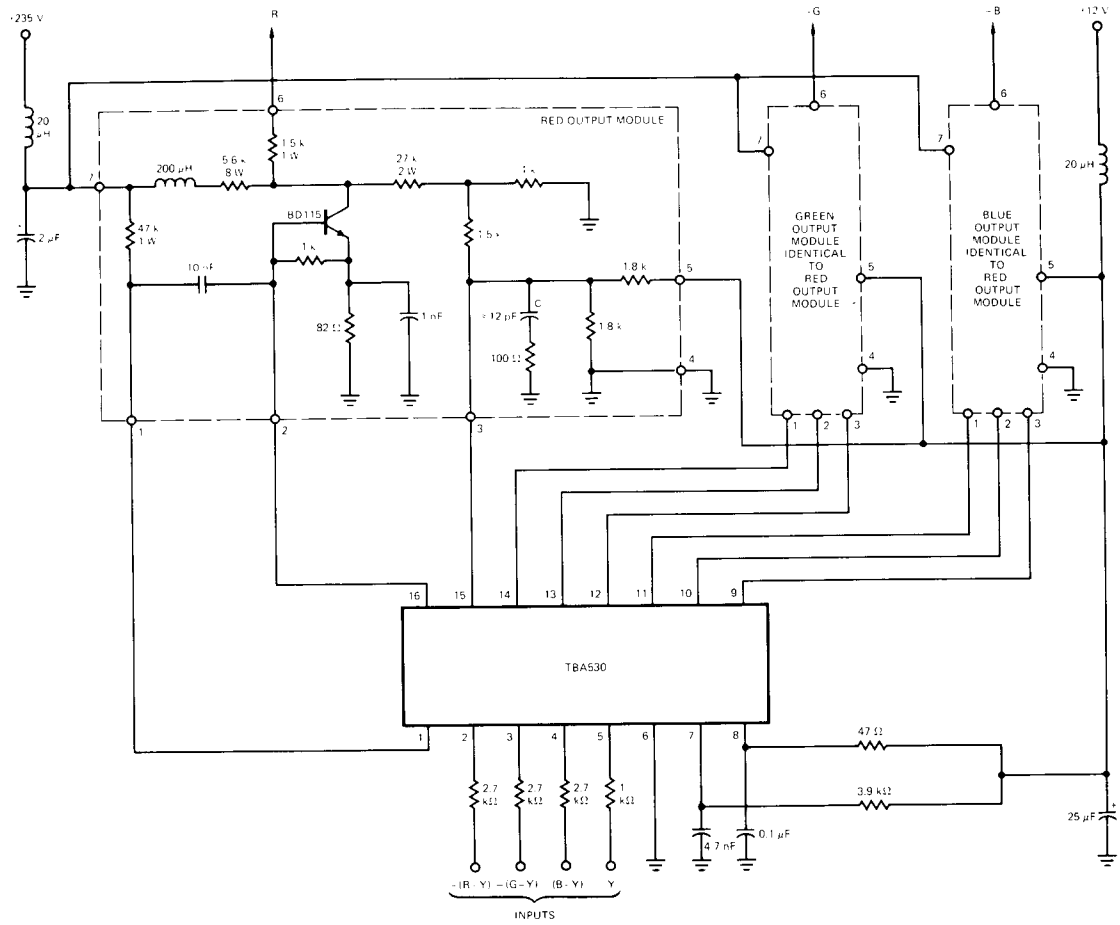
CHARACTERISTICS	MIN	TYP	MAX	UNITS
Supply Current I		30		mA
Required Input Signals				
R-Y (V_2)		1.4		V_{pk-pk}
G-Y (V_3)		0.82		V_{pk-pk}
B-Y (V_4)		1.78		V_{pk-pk}
Y (V_5)		1.0		V_{pk-pk}
Gain of Channels (B-Y; G-Y, R-Y) at f = 0.5 MHz (Note 2)		100		
Gain Ratio Luminance to Each Color Amplifier		1.0		
DC Output Voltage, Each Channel		165		V
Input Resistance (Color) f = 1 kHz (R2, R3, R4)		60		kΩ
Input Resistance (Luminance) f = 1 kHz (R5)		20		kΩ
Input Capacitance (Color) f = 1 kHz (C2, C3, C4)		3.0		pF
Input Capacitance (Luminance) f = 1 kHz (C5)		10		pF
Bandwidth, Each Channel 3 dB		6.0		MHz

NOTE:
2. Gain is defined as the voltage ratio between the input signals at pins 2, 3, 4 and the output signals at the collectors of the output transistors.

BLOCK DIAGRAM



APPLICATION CIRCUIT



NOTE:
When using a socket for the IC, shut off the power supplies before inserting or changing devices.

APPLICATIONS INFORMATION

The function is quoted against the corresponding pin number:

1. **Output load resistor, red signal** (pin 11, blue signal; pin 14, green signal). Resistors (47 kΩ, 1 W) connected to +235 V provide the high value loads for the internal amplifying stages. The nominal operating potential on these pins is defined by an internal Zener type junction and the dc feedback and is approximately +8 V. The maximum current which can be allowed at each of these pins is 10 mA.
2. **R-Y input signal** (pin 3: G-Y input signal, pin 4: B-Y input signal). This signal is fed via a low-pass filter from the TBA520 or TBA990 demodulator having a dc level of +7.5 V and an amplitude of 1.40 $V_{pk\text{-}pk}$.
3. **G-Y input signal** The dc black level of this signal is +7.5 V and its amplitude is 0.82 $V_{pk\text{-}pk}$ (pin 2).
4. **B-Y input signal** The dc black level of this signal is +7.5 V and its amplitude is 1.78 $V_{pk\text{-}pk}$ (pin 2).
5. **Luminance signal input** The dc level on this pin for picture black is +1.5 V. The required signal amplitude is 1.0 V black-to-white with negative-going sync (or blanking) for cathode drive as shown.
6. **Ground**
7. **Current feed point** — A current of approximately 2.5 mA is required at this pin, fed via a 3.9 kΩ resistor from +12 V, to bias the internal differential amplifiers. A decoupling capacitor of 4.7 nF is necessary.
8. **Positive 12 V supply** — Maximum supply voltage permitted, 13.2 V.
9. **Blue channel feedback** (pin 12, green channel; pin 15, red channel). The dc working points and gains of both the output stages and the IC amplifier stages are stabilized by the feedback circuits. The black level potentials at the collectors of the output stages (tube cut-off) are adjusted by correctly setting the dc level of the color difference signals produced by the demodulator IC. The gains of the RGB output stages are adjusted to give the correct white temperature setting on the picture tube by adjusting the 1.5 kΩ resistor in the feedback paths. (See applications circuit)
10. **Blue signal output** (green and red signal outputs on pins 13 and 16). These pins internally connected with pins 11, 14 and 1 respectively via Zener type junctions to give a dc level shift appropriate for driving the output transistor bases directly. To by-pass the Zener junctions at high frequencies three 10 nF capacitors are required.
11. **Output load resistor,** blue channel (see pin 1).
12. **Green channel feedback** (see pin 9).
13. **Green channel output** (see pin 10).
14. **Output load resistor,** green channel (see pin 1).
15. **Red channel feedback** (see pin 9).
16. **Red signal output** (see pin 10).

BRIEF PERFORMANCE DETAILS AND COMMENTS

1. Spread of the ratio of voltage gains for color difference and luminance signal inputs 0.9 to 1.1.
2. Very careful attention to ground paths should be given, avoiding common impedances between the input (decoder) side and the output stages. Also, to enable matched performance to be achieved, a symmetrical board and component layout should be adopted for the three output stages. To compensate for the effect upon high frequency response of inevitable differences, e.g., the absence of a potentiometer in one of the stages, the compensating capacitors (C) may be appropriately selected for any given board layout.
3. The signal black level at the collectors of the RGB output stages depends upon the +12 V supply, the dc level of the color difference signals from the demodulator IC and the black level potential of the luminance signal applied to the TBA530 matrix IC. The dc levels of the signals produced and handled by the ICs are designed to have approximately proportional tracking with the 12 V supply potential.

$$\text{i.e., } \frac{\Delta V \text{ (dc level, signal)}}{\Delta V+} \approx \frac{V\text{nom (dc level, signal)}}{12}$$

To ensure that changes in picture black level due to variations on the 12 V supply to the ICs occur in a predictable way, all the ICs should be operated from a common supply line. This is specially important for the TBA520 or TBA990 and TBA530. Furthermore, to limit the changes in picture black level during receiver operation, the 12 V supply should have a stability of not worse than ± 3% due to operational variations, and preferably be tracked with the screen-grid supply of the picture tube.