

# CA3217

## Single Chip TV Chroma/Luminance Processor

May 1997

**NOT RECOMMENDED FOR NEW DESIGNS**

### Features

- All Chroma Processing and Demodulating Circuitry on a Single Chip in a 28 Lead Plastic Package
- Phase Locked Subcarrier Regeneration Utilizing Sample and Hold Techniques
- Supplementary ACC with Overload Detector to Prevent Over Saturation of the Picture Tube
- Linear DC Controls for Chroma Gain and Tint
- Dynamic "Flesh Correction" - Corrects Purple and Green Flesh Colors without Affecting Primary Colors
- Balanced Chroma Demodulators with Low Output Impedance for Direct Coupling
- Internal RF Filtering
- Requires Few External Components
- Automatic Beam Limiter
- Chroma Luminance Tracking Picture Control

### Description

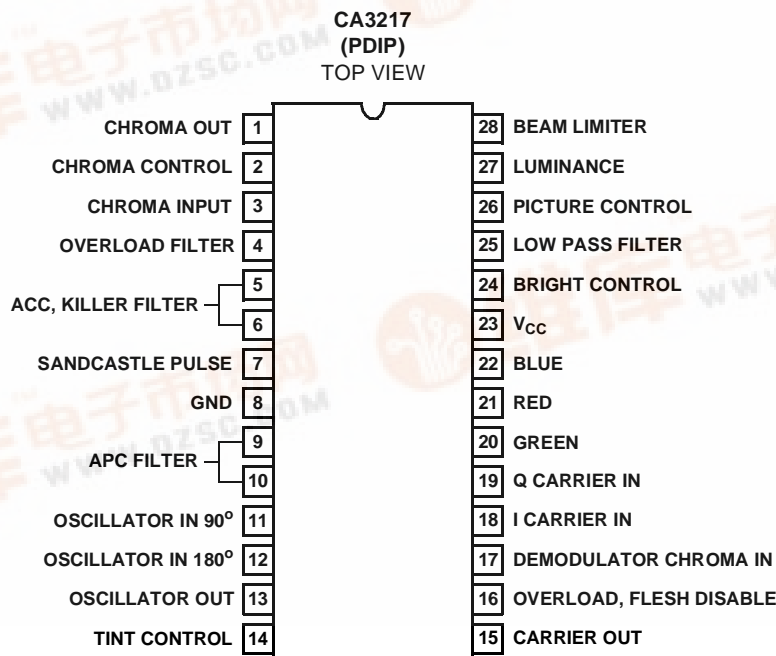
The Harris CA3217E (Note) is a monolithic silicon integrated circuit. It contains all the required circuit functions between the video detector and the picture tube RGB driver stages of a color television receiver. The CA3217E decodes the chrominance signals and then produces three different color signals that are internally combined with the luminance to develop the RGB signals. The picture saturation, hue and brightness DC controls are externally adjustable by the viewers. The AFPC, ACC, Dynamic flesh control, Beam limiting and Gate black level (Brightness) control are servo loops used to stabilize the RGB output and reduce frequent manual adjustment. The automatic beam limiter circuit reduces picture contrast and brightness to prevent excessive drive output at the picture tube.

NOTE: Formerly Developmental Type No. TA10806.

### Ordering Information

| PART NUMBER | TEMPERATURE RANGE | PACKAGE      |
|-------------|-------------------|--------------|
| CA3217E     | -40°C to +85°C    | 28 Lead PDIP |

### Pinout



## Specifications CA3217

### Absolute Maximum Ratings

DC Voltage (Between Terminals 23 and 8) ..... 14.0V  
 Power Dissipation  
 Up to  $T_A = +55^\circ\text{C}$  ..... 1.27W  
 Above  $T_A = +55^\circ\text{C}$  ..... Derate Linearly at  $13.3\text{mW}/^\circ\text{C}$   
 Junction Temperature (Plastic Package) .....  $+150^\circ\text{C}$   
 Storage Temperature Range .....  $-65^\circ\text{C}$  to  $+150^\circ\text{C}$   
 Lead Temperature (Soldering 10s) .....  $+300^\circ\text{C}$

### Operating Conditions

Operating Temperature Range .....  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$

*CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.*

### Electrical Specifications $T_A = +25^\circ\text{C}$

| PARAMETERS   | TEST CONDITIONS |       |       |      |      |       |                             |                               |                           |                     |  | MIN  | TYP  | MAX  | UNITS             |
|--|-----------------|-------|-------|------|------|-------|-----------------------------|-------------------------------|---------------------------|---------------------|--|------|------|------|-------------------|
|  | TEST            | S2    | S3    | S4   | S5   | S6    | mV <sub>P-P</sub><br>CHROMA | mV <sub>P-P</sub><br>BURST IN | mV <sub>P-P</sub><br>LUMA | RELAYS<br>ENERGIZED |  |      |      |      |                   |
| DC ELECTRICAL SPECIFICATIONS (Test 1 Through 5)          |                 |       |       |      |      |       |                             |                               |                           |                     |  |      |      |      |                   |
| Dissipation  | Pin 23          | 6.3V  | 11.2V | 4.0V | 6.3V | 11.2V |                             |                               |                           |                     |  | 30   | 48   | 66   | mA                |
| Pin 1 Bal  | XPT1            | 1.2V  | 11.2V | 4.0V | 6.3V | 11.2V |                             |                               |                           |                     |  |      | 10.5 |      | V <sub>DC</sub>   |
| Pin 3 Bal  | XPT1            | 1.2V  | 11.2V | 4.0V | 6.3V | 11.2V |                             |                               |                           |                     |  |      | 2.2  |      | V <sub>DC</sub>   |
| Pin 17 Bal   | XPT9            | 1.2V  | 11.2V | 4.0V | 6.3V | 11.2V |                             |                               |                           |                     |  |      | 3.0  |      | V <sub>DC</sub>   |
| Pin 13 Bal   | XPT<br>13       | 1.2V  | 11.2V | 4.0V | 6.3V | 11.2V |                             |                               |                           |                     |  |      | 7.5  |      | V <sub>DC</sub>   |
| SWITCHING ELECTRICAL SPECIFICATIONS (Tests 6 Through 26) |                 |       |       |      |      |       |                             |                               |                           |                     |  |      |      |      |                   |
| Oscillator Pull-In (Note 1)                              | "D"             | 6.3V  | 11.2V | 4.0V | 6.3V | 11.2V | 25                          | 25                            |                           | K4, K7              |  | -350 |      | +350 | Hz                |
| Oscillator Level   | "D"             | 6.3V  | 11.2V | 4.0V | 6.3V | 11.2V | 0                           | 0                             |                           | K7                  |  |      | 0.7  |      | V <sub>P-P</sub>  |
| 100% ACC (Note 2)  | P21             | Vary  | 11.2V | 4.0V | 6.3V | 11.2V | 125                         | 125                           |                           | K4, K7              |  |      | 1.5  |      | V <sub>P-P</sub>  |
| 200% ACC (Note 3)  | P21             | T8    | 11.2V | 4.0V | 6.3V | 11.2V | 250                         | 250                           |                           | K4, K7              |  |      | 100  |      | %                 |
| 20% ACC (Note 3)   | P21             | T8    | 11.2V | 4.0V | 6.3V | 11.2V | 25                          | 25                            |                           | K4, K7              |  |      | 90   |      | %                 |
| Tint Center (Note 4)                                     | S5              | Vary  | 11.2V | 4.0V | Vary | 11.2V | 250                         | 125                           |                           | K4, K7              |  |      | 6.5  |      | V <sub>DC</sub>   |
| R-Y Maximum  | P21             | 11.2V | 11.2V | 6.0V | T11  | 11.2V | 250                         | 125                           |                           | K1, K4, K7          |  |      | 6.0  |      | V <sub>P-P</sub>  |
| Unkill   | P21             | 11.2V | 11.2V | 4.0V | T11  | 11.2V | 25                          | 12.5                          |                           | K4, K7              |  |      | 4.5  |      | V <sub>P-P</sub>  |
| Kill   | P21             | 11.2V | 11.2V | 4.0V | T11  | 11.2V | 25                          | 2.5                           |                           | K4, K7              |  |      |      | 150  | mV <sub>P-P</sub> |
| Chroma Reserver  | P21             | 11.2V | 11.2V | 4.0V | T11  | 11.2V | 12.5                        | 125                           |                           | K2, K4, K7          |  |      | 2.0  |      | V <sub>P-P</sub>  |
| Maximum Luma (Note 5)                                    | P21             | 11.2V | 11.2V | 4.0V | T11  | 11.2V |                             |                               | 125                       | K1, K3, K7          |  |      | 2.2  |      | V <sub>P-P</sub>  |
| Luma Ratio (Note 6)                                      | P21             | 11.2V | 6.3V  | 4.0V | T11  | 11.2V |                             |                               | 125                       | K1, K3, K7          |  |      | 50   |      | %                 |
| Linearity (Note 7)                                       | P21             | 11.2V | Vary  | 3.0  | T11  | 11.2V |                             |                               | 425                       | K3, K7              |  |      | 4    |      | V <sub>P-P</sub>  |
| T19 = T19/T18  | P21             | 11.2V | T18   | 3.0  | T11  | 11.2V |                             |                               | 212.5                     | K3, K7              |  |      | 50   |      | %                 |
| 4.78MHz Response (Note 8)                                | P21             | 11.2V | 11.2V | 4.0V | T11  | 11.2V |                             |                               | 125                       | K3, K6, K7          |  | -3   |      | 3    | dB                |
| Contrast Limit 1 (Note 9)                                | P24             | 11.2V | 11.2V | 4.0V | T11  | 11.2V |                             |                               | 250                       | K3, K5, K7          |  |      | 3.9  |      | V <sub>DC</sub>   |
| Contrast Limit 2 (Note 9)                                | P26             | 11.2V | 11.2V | 4.0V | T11  | 11.2V |                             |                               | 250                       | K3, K5, K7          |  |      | 8.2  |      | V <sub>DC</sub>   |
| Bright Limit 1 (Note 10)                                 | P24             | 11.2V | 11.2V | 4.0V | T11  | 11.2V |                             |                               | 250                       | K3, K5, K7          |  |      | 3.1  |      | V <sub>DC</sub>   |
| Bright Limit 2 (Note 10)                                 | P26             | 11.2V | 11.2V | 4.0V | T11  | 11.2V |                             |                               | 250                       | K3, K5, K7          |  |      | 5.6  |      | V <sub>DC</sub>   |
| G-Y Ratio (Note 11)                                      | P20             | Vary  | 11.2V | 4.0V | T11  | 11.2V | 250                         | 125                           |                           |                     |  |      | 0.33 |      | R                 |
| B-Y Ratio (Note 11)                                      | P22             | T25   | 11.2V | 4.0V | T11  | 11.2V | 250                         | 125                           |                           |                     |  |      | 1.20 |      | R                 |

#### NOTES:

- With  $K_7$  energized and frequency counter at D vary  $C_1$  for 3.579175MHz. Then with  $K_4$  energized, check for pull-in. Repeat for frequency tuned to 3.579875MHz. For all other tests tune to 3.579545MHz  $\pm 10\text{Hz}$ .
- Vary  $S_2$  for 1.5V<sub>P-P</sub> at Pin 21.
- % of 100% ACC.
- Adjust  $C_1$  for 3.579545MHz  $\pm 10\text{Hz}$ . Adjust  $S_2$  for 1.6V<sub>P-P</sub> at Pin 22 and 0 reference, then adjust  $S_5$  for minimum at P21. Read and record  $S_5$  voltage.
- Black to White.
- T17 = T17/T16.
- Adjust  $S_3$  for 4.0V<sub>P-P</sub>.
- AC amplitude = 50mV<sub>P-P</sub> reference 15kHz.
- Adjust beam limiter to 10.7V.
- Adjust beam limiter to 9.8V.
- Adjust  $S_2$  for 1.5V<sub>P-P</sub> at Pin 21, then calculate P20/P21 and P22/P21.

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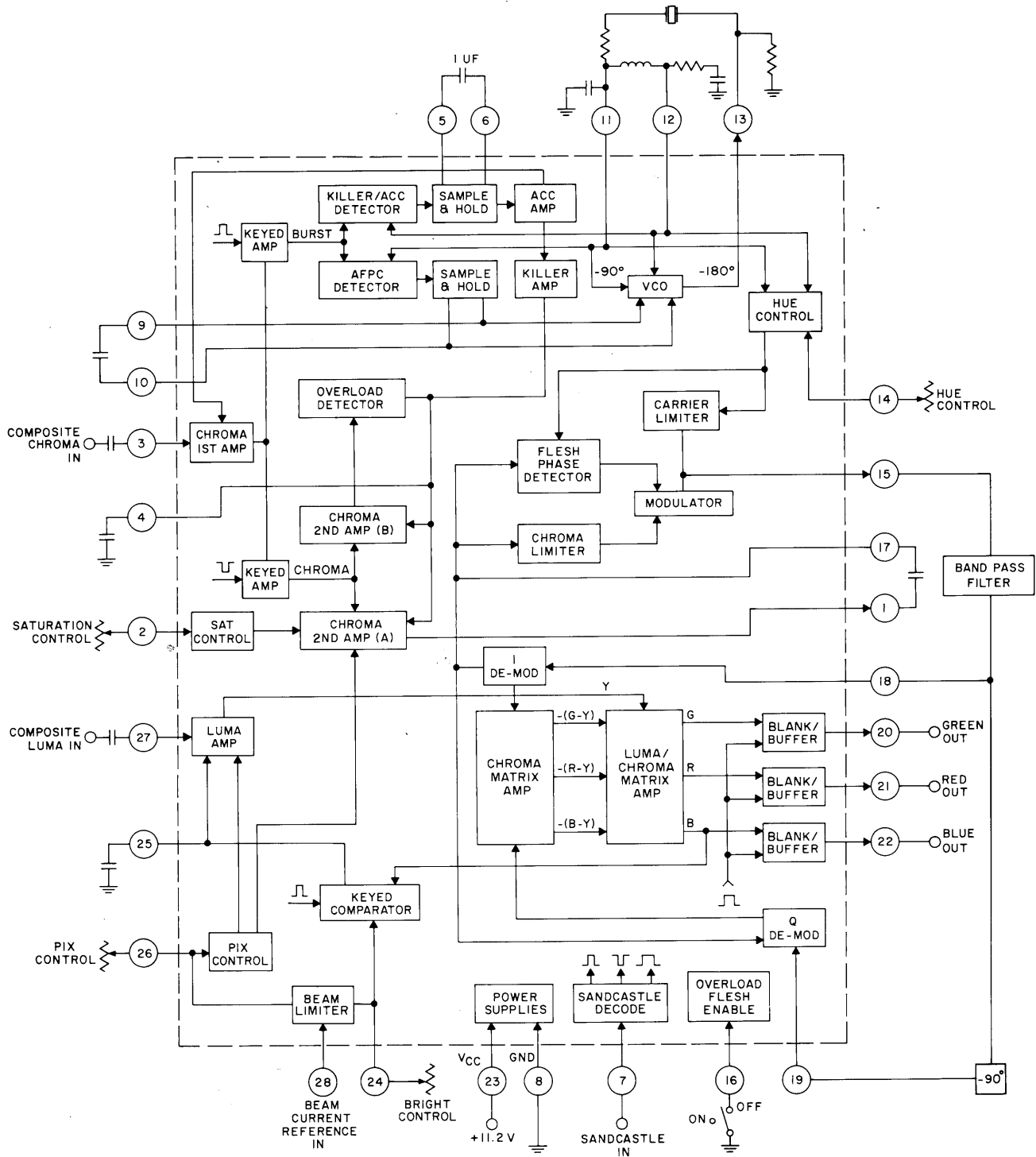
### Typical Performance of the CA3217E

| FUNCTION   | TYPICAL DATA                          |       |
|--|---------------------------------------|-------|
| Nominal Supply   | 11.2V                                 |       |
| Nominal Dissipation                                      | 500mW                                 |       |
| Oscillator Stability                                     |                                       |       |
| Supply Variation $10^{-14}V$                             | 5Hz                                   |       |
| Variation With Temperature ( $\Delta T = +50^{\circ}C$ ) | 25Hz                                  |       |
| AFPC Characteristics                                     |                                       |       |
| DC Loop Gain   | 33Hz/Degree                           |       |
| Pull In Range  | $\pm 500Hz$                           |       |
| ACC Characteristics                                      |                                       |       |
| 100% Chroma Input Level                                  | 250mV <sub>P-P</sub> on Red Bar       |       |
| 3dB Point  | At 20% Nominal Input Level            |       |
| Hue Control Range  | 100°                                  |       |
| Saturation Control Range                                 | 40dB (Min)                            |       |
| DEMODULATOR PARAMETERS                                   | RELATIVE AMPLITUDE                    | ANGLE |
| R - Y  | 1.0                                   | 93°   |
| B - Y  | 1.2                                   | 2°    |
| G - Y  | 0.3                                   | 258°  |
| Bandwidth (Chroma)                                       | 900kHz                                |       |
| Flesh Control  | Primary Control in the +1 Half Plane  |       |
| Chroma Overload Control                                  | Two Levels                            |       |
| Picture Control  | 40dB                                  |       |
| Brightness Control                                       | Black Level Clamped on 3V to 5V Level |       |
| Beam Limiting  | On Picture and Brightness Controls    |       |
| Luma Bandwidth   | 5MHz (Min)                            |       |
| Sandcastle Input   |                                       |       |
| 1.2 - 2.3V   | Blanking                              |       |
| >3.3V  | Burst Gate                            |       |
| Maximum Linear Output                                    |                                       |       |
| R  | 5V                                    |       |
| G  | 3V                                    |       |
| B  | 3.7V                                  |       |

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## Functional Block Diagram

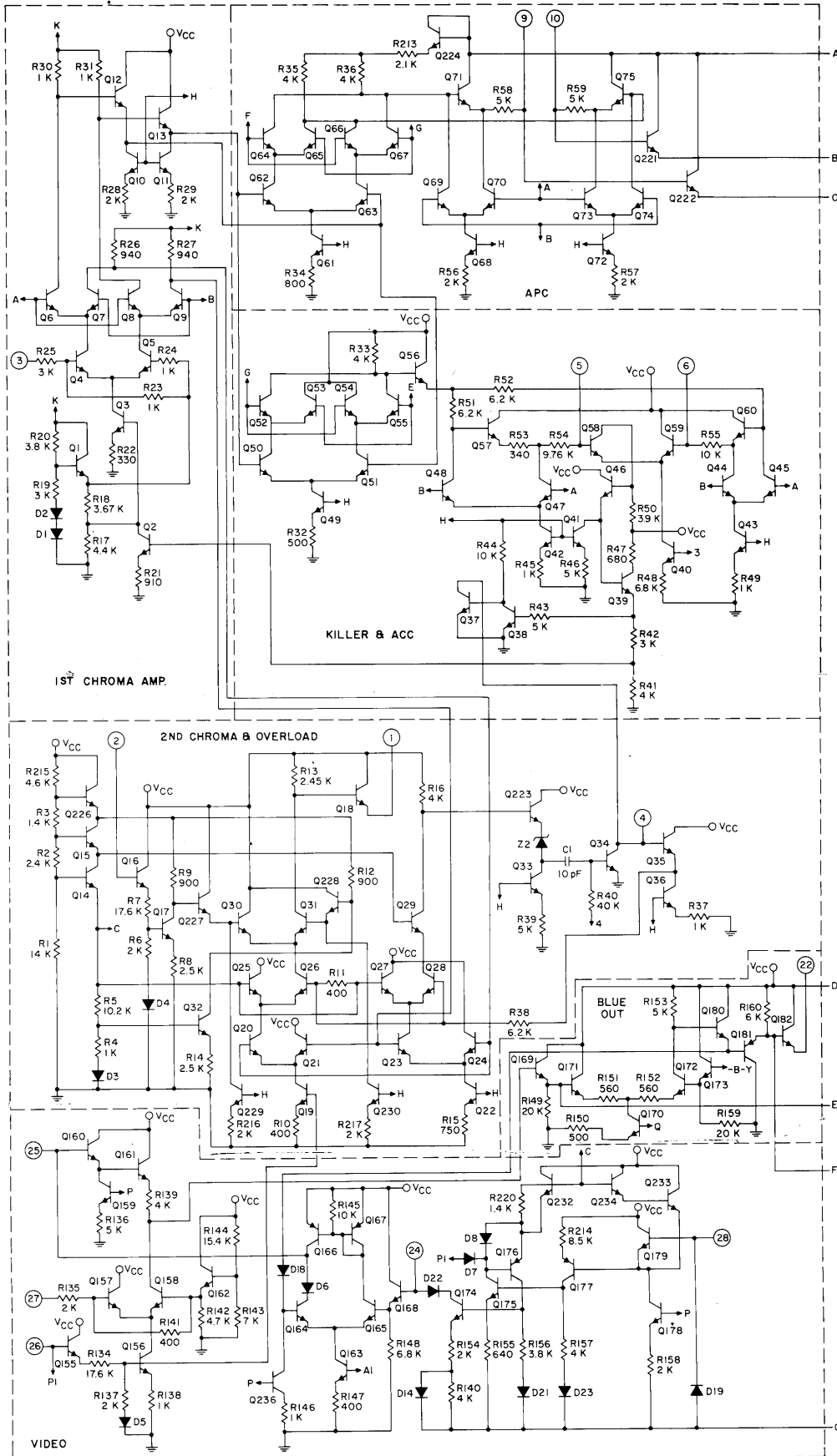
CA3217E



# CA3217

## Schematic Diagram

CA3217E





# CA3217

## Test Circuit

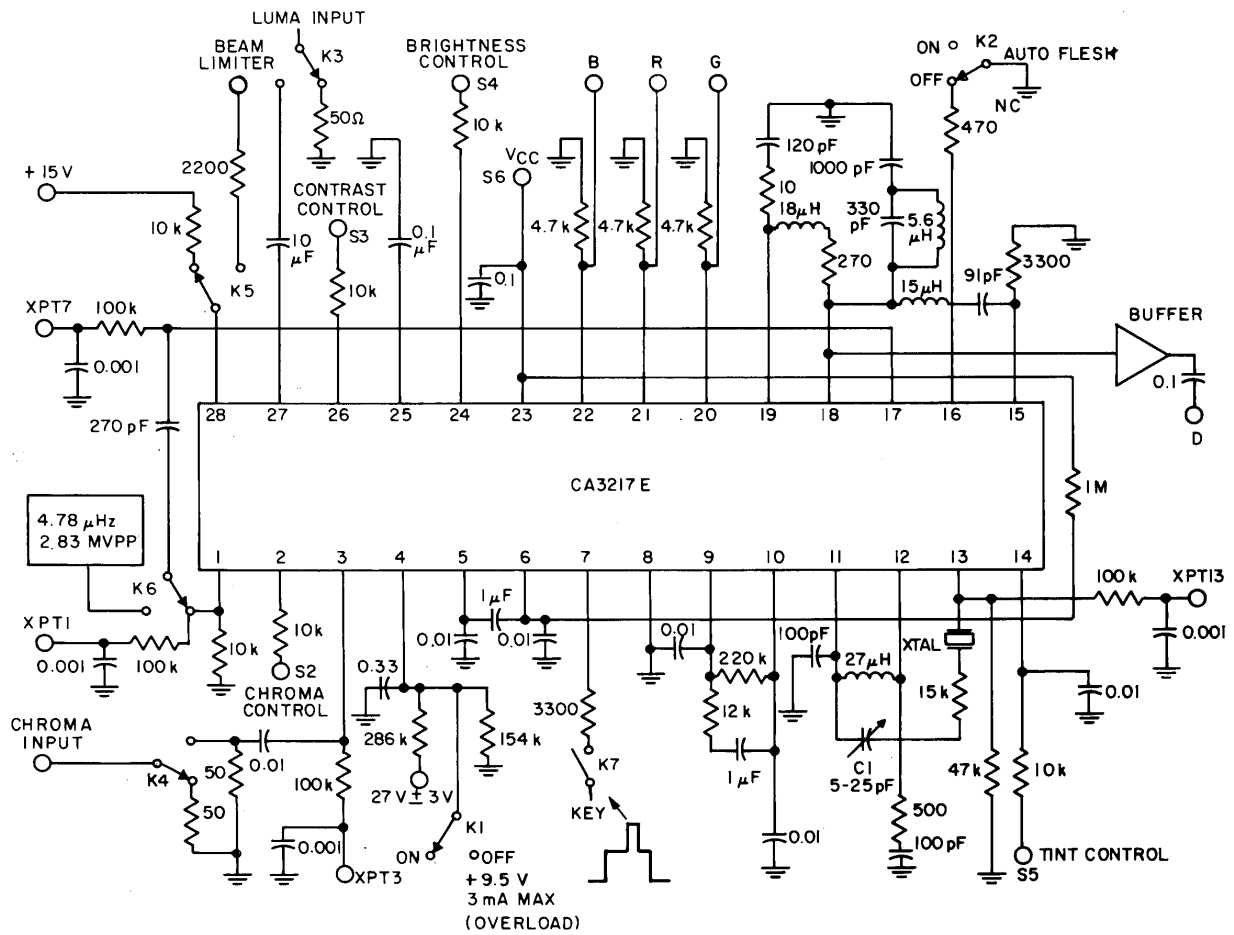


FIGURE 1. TEST CIRCUIT FOR CA3217E

## Typical Performance Curves

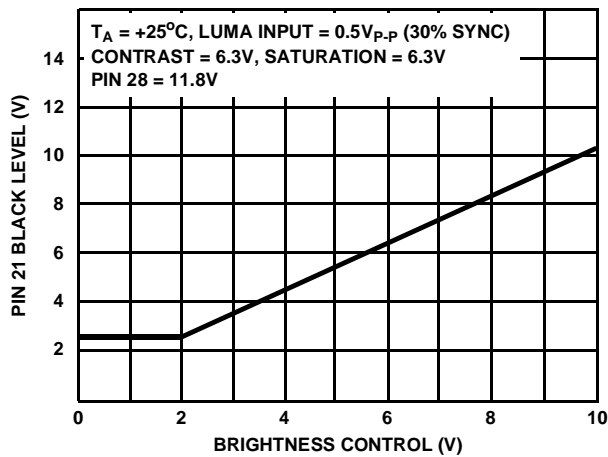


FIGURE 2. TYPICAL P<sub>21</sub> BLACK LEVEL VERSUS BRIGHTNESS CONTROL

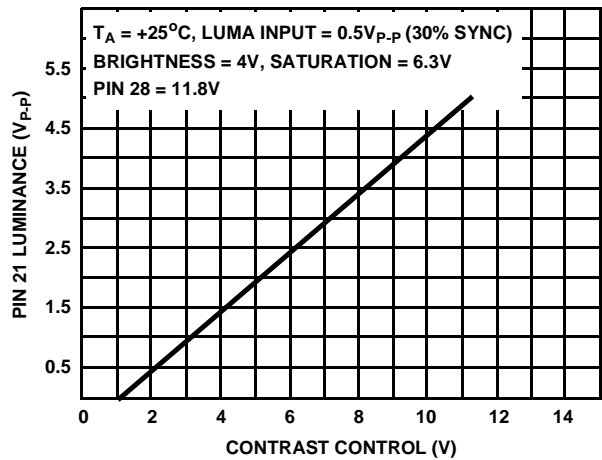


FIGURE 3. TYPICAL P<sub>21</sub> LUMINANCE OUTPUT vs CONTRAST CONTROL

Typical Performance Curves (Continued)

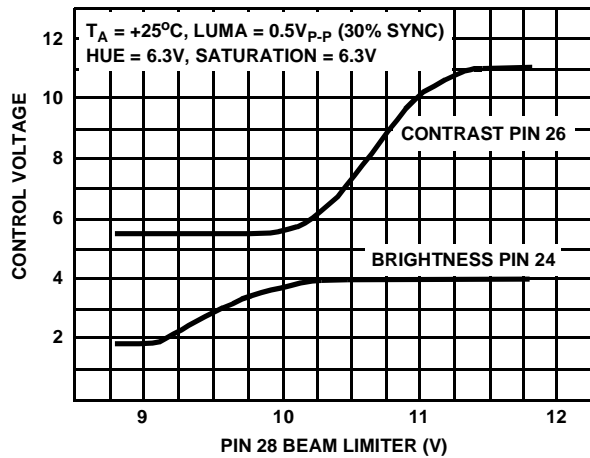


FIGURE 4. TYPICAL BEAM LIMITER vs CONTRAST AND BRIGHTNESS

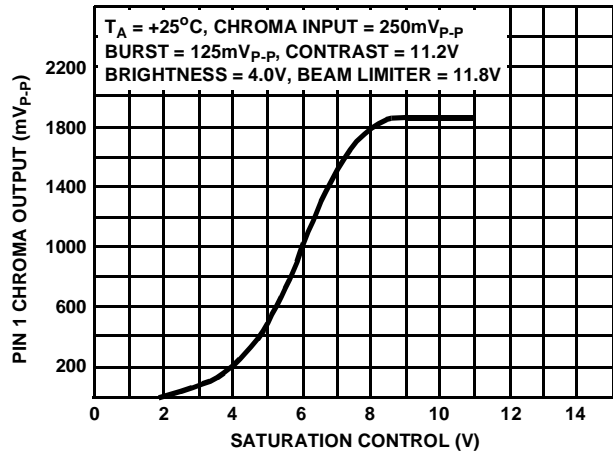


FIGURE 5. TYPICAL P<sub>1</sub> CHROMA OUTPUT vs SATURATION CONTROL

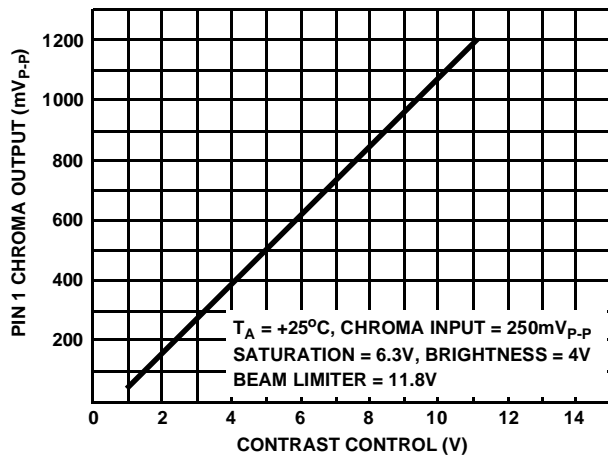


FIGURE 6. TYPICAL P<sub>1</sub> CHROMA OUTPUT vs CONTRAST CONTROL

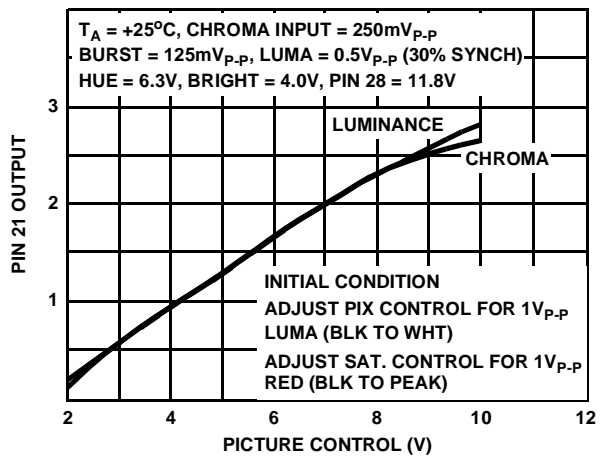
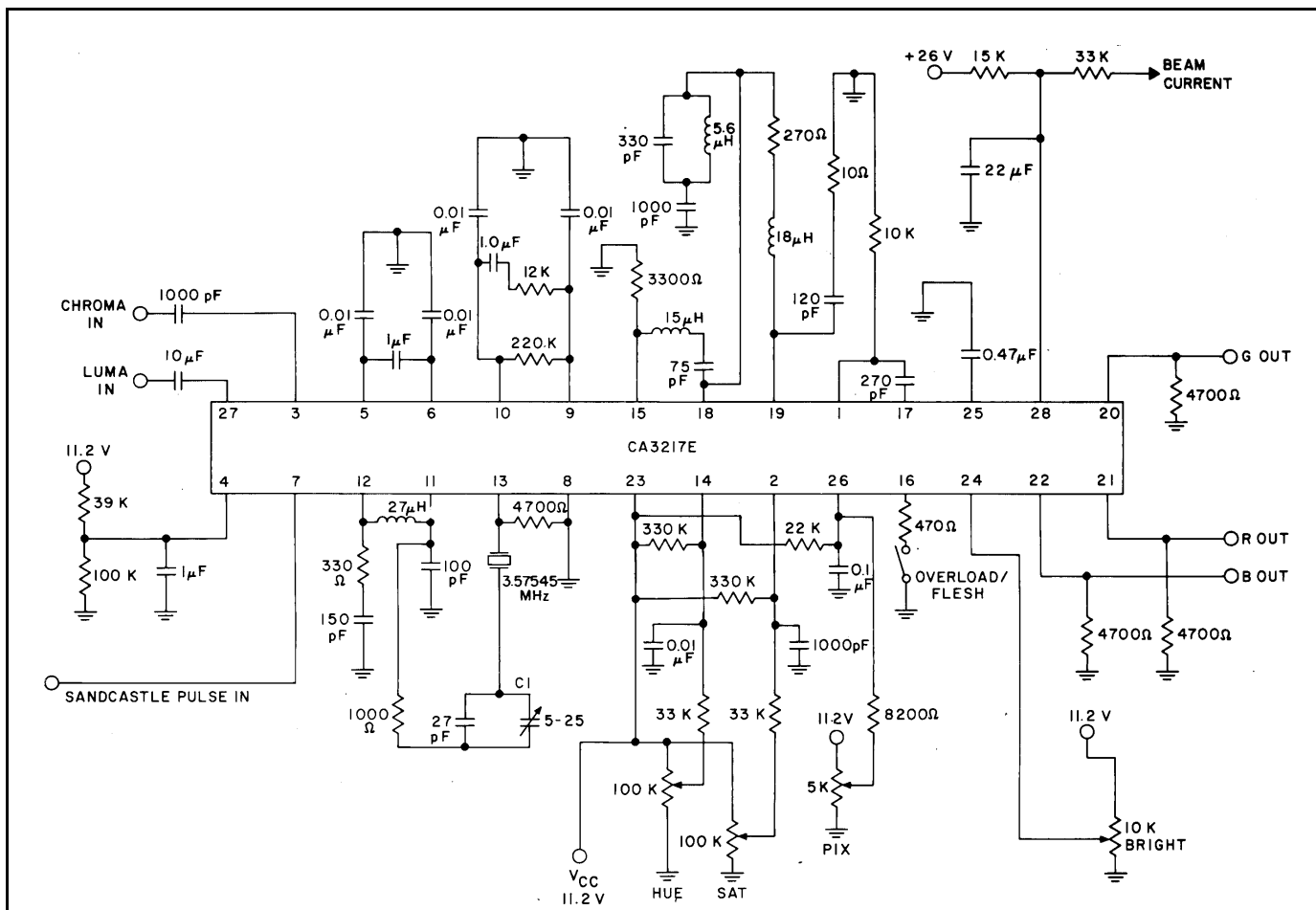


FIGURE 7. TYPICAL LUMA/CHROMA TRACK



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**FIGURE 8. TYPICAL APPLICATION CIRCUIT**

