

Single Chip TV Chroma/Luminance Processor

August 1991

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

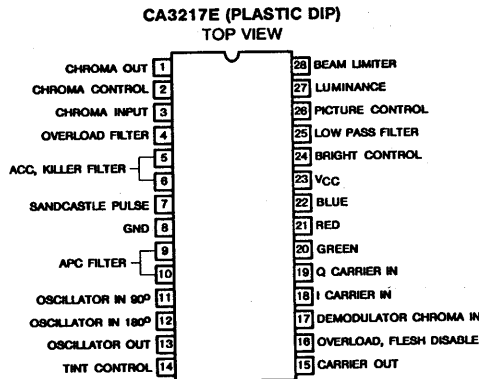
Description

The Harris CA3217E* 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.

The CA3217E is supplied in a 28-lead dual-in-line plastic package.

* Formerly RCA Dev. Type No. TA10806.

Pinout



Absolute Maximum Ratings

DC Supply Voltage	14.0V
Between Terms 23 and 8	
Device Dissipation:	
Up to $T_A = 55^\circ\text{C}$	1.27W
Above $T_A = 55^\circ\text{C}$	Derate Linearly at 13.3mW/°C
Ambient Temperature Range:	
Operating	-40 to +85°C
Storage	-65 to +150°C
Lead Temperature (During Soldering):	
At Distance 1/16 ± 1/32 Inch (1.59 ± 0.79mm)	
from Case for 10 Seconds Max.	+265°C

C14 3217

Specifications CA3217

ELECTRICAL CHARACTERISTICS at T_A = 25°C

CHARACTERISTIC	TEST CONDITIONS											LIMITS			UNITS
	Test	S ₂	S ₃	S ₄	S ₅	S ₆	mV _{p-p} Chroma	mV _{p-p} Burst In	mV _{p-p} Luma	Relays Energized	Note	Min.	Typ.	Max.	
STATIC (Test 1-5)															
Dissipation	Pin 23	6.3 V	11.2 V	4.0 V	6.3 V	11.2 V						30	48	66	mA
Pin 1 Bal	XPT1	1.2 V	11.2 V	4.0 V	6.3 V	11.2 V							10.5	V _{dc}	
Pin 3 Bal	XPT1	1.2 V	11.2 V	4.0 V	6.3 V	11.2 V							2.2		
Pin 17 Bal	XPT9	1.2 V	11.2 V	4.0 V	6.3 V	11.2 V							3.0		
Pin 13 Bal	XPT13	1.2 V	11.2 V	4.0 V	6.3 V	11.2 V							7.5		
DYNAMIC (Test 6-26)															
Oscillator Pull-In	"D"	6.3 V	11.2 V	4.0 V	6.3 V	11.2 V	25	25		K4, K7	1	-350		+350	Hz
Oscillator Level	"D"	6.3 V	11.2 V	4.0 V	6.3 V	11.2 V	0	0		K7			0.7		V _{p-p}
100% Acc	P21	Vary	11.2 V	4.0 V	6.3 V	11.2 V	125	125		K4, K7	2		1.5		%
200% Acc	P21	T8	11.2 V	4.0 V	6.3 V	11.2 V	250	250		K4, K7	3		100		
20% Acc	P21	T8	11.2 V	4.0 V	6.3 V	11.2 V	25	25		K4, K7	3		90		
Tint Center	S5	Vary	11.2 V	4.0 V	Vary	11.2 V	250	125		K4, K7	4		6.5		V _{dc}
R-Y Maximum	P21	11.2 V	11.2 V	6.0 V	T11	11.2 V	250	125		K1, K4, K7			6.0		V _{p-p}
Unkill	P21	11.2 V	11.2 V	4.0 V	T11	11.2 V	25	12.5		K4, K7			4.5		mV _{p-p}
Kill	P21	11.2 V	11.2 V	4.0 V	T11	11.2 V	25	2.5		K4, K7				150	
Chroma Reserver	P21	11.2 V	11.2 V	4.0 V	T11	11.2 V	12.5	125		K2, K4, K7			2.0		V _{p-p}
Maximum Luma	P21	11.2 V	11.2 V	4.0 V	T11	11.2 V			125	K1, K3, K7	5		2.2		%
Luma Ratio	P21	11.2 V	6.3 V	4.0 V	T11	11.2 V			125	K1, K3, K7	6		50		
Linearity	P21	11.2 V	Vary	3.0	T11	11.2 V			425	K3, K7	7		4		V _{p-p}
T19 = T19/T18	P21	11.2 V	T18	3.0	T11	11.2 V			212.5	K3, K7			50		%
4.78 MHz Response	P21	11.2 V	11.2 V	4.0 V	T11	11.2 V			125	K3, K6, K7	8	-3		3	dB
Contrast Limit 1	P24	11.2 V	11.2 V	4.0 V	T11	11.2 V			250	K3, K5, K7	9		3.9		V _{dc}
Contrast Limit 2	P26	11.2 V	11.2 V	4.0 V	T11	11.2 V			250	K3, K5, K7	9		8.2		
Bright Limit 1	P24	11.2 V	11.2 V	4.0 V	T11	11.2 V			250	K3, K5, K7	10		3.1		
Bright Limit 2	P26	11.2 V	11.2 V	4.0 V	T11	11.2 V			250	K3, K5, K7	10		5.6		
G-Y Ratio	P20	Vary	11.2 V	4.0 V	T11	11.2 V	250	125			11		0.33		R
B-Y Ratio	P22	T25	11.2 V	4.0 V	T11	11.2 V	250	125			11		1.20		

Notes:

- With K7 energized and frequency counter at D vary C1 for 3.579175 MHz. Then with K4 energized, check for pull-in. Repeat for frequency tuned to 3.579875 MHz. For all other tests tune to 3.579545 MHz ± 10 Hz.
- Vary S2 for 1.5 V_{p-p} at Pin 21.
- % of 100% ACC.
- Adjust C1 for 3.579545 MHz ± 10 Hz. Adjust S2 for 1.6V V_{p-p} at Pin 22 and 0 reference; then adjust S5 for minimum at P21. Read and record S5 voltage
- Black to White.
- T17 = T17/T16.
- Adjust S3 for 4.0 V_{p-p}.
- AC amplitude = 50 mV_{p-p} reference 15 kHz.
- Adjust beam limiter to 10.7 V.
- Adjust beam limiter to 9.8 V.
- Adjust S2 for 1.5 V_{p-p} 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	500 mW		
Oscillator Stability	5 Hz		
Supply Variation 10-14 V	5 Hz		
Variation with Temperature ($\Delta T = 50^\circ C$)	25 Hz		
AFPC Characteristics	33 Hz/degree		
dc Loop Gain	33 Hz/degree		
Pull-in Range	± 500 Hz		
ACC Characteristic	250 mV _{p-p} on red bar		
100% Chroma Input Level	at 20% nominal input level		
3-dB Point	100°		
Hue-Control Range	40 dB min		
Saturation-Control Range	40 dB min		
Demodulator Characteristics:	Relative Amplitude	Angle	
	R — Y	1.0	93°
	B — Y	1.2	2°
	G — Y	0.3	258°
Bandwidth (Chroma)	900 kHz		
Flesh Control	Primary control in the +1 half-plane		
Chroma Overload Control	Two levels		
Picture Control	40 dB		
Brightness Control	Black level clamped on 3 V to 5 V level		
Beam Limiting	On picture and brightness controls		
Luma Bandwidth	5 MHz min		
Sandcastle Input	Blanking		
1.2 — 2.3 V	Burst gate		
>3.3 V			
Maximum Linear Output			
R	5 V		
G	3 V		
B	3.7 V		

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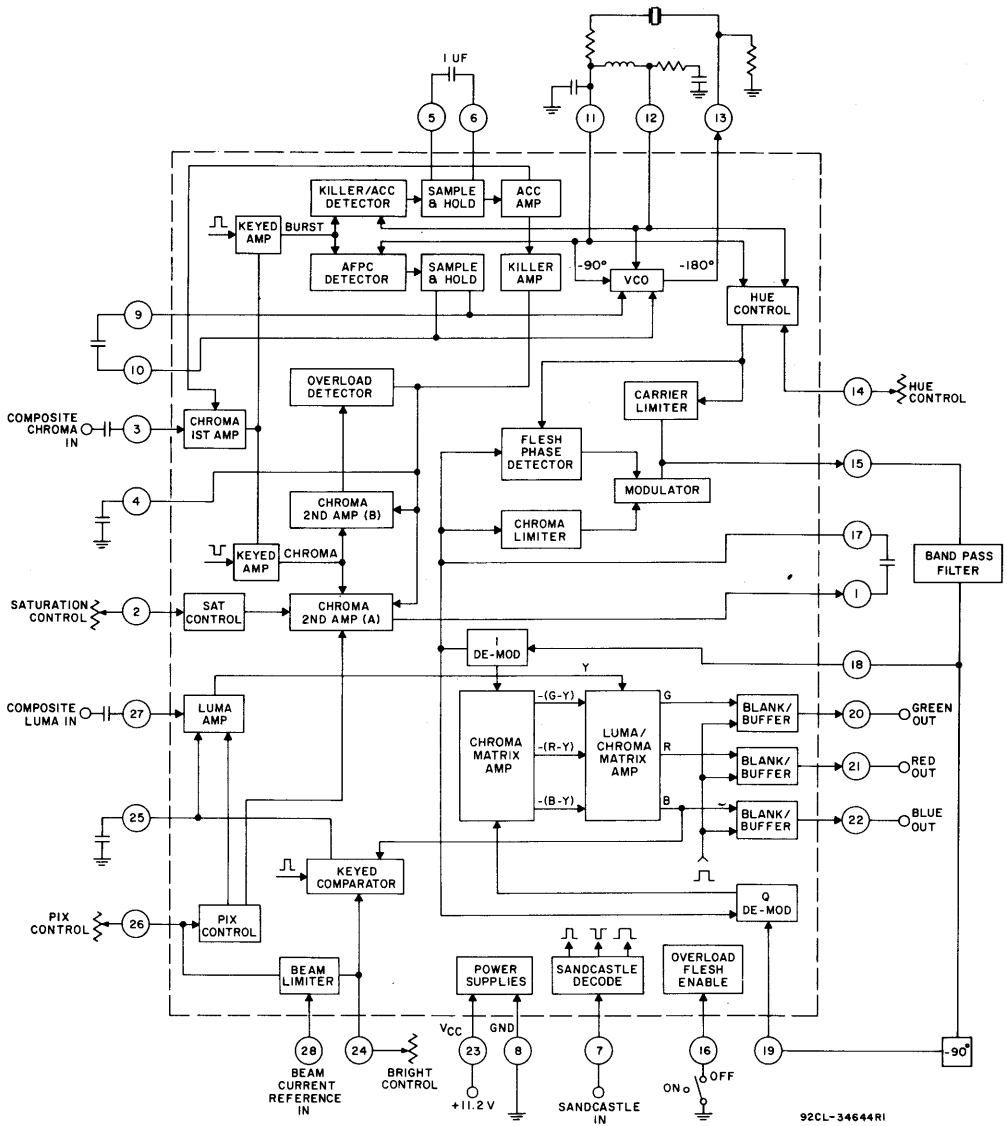


Fig. 1 - Functional block diagram of the CA3217E.

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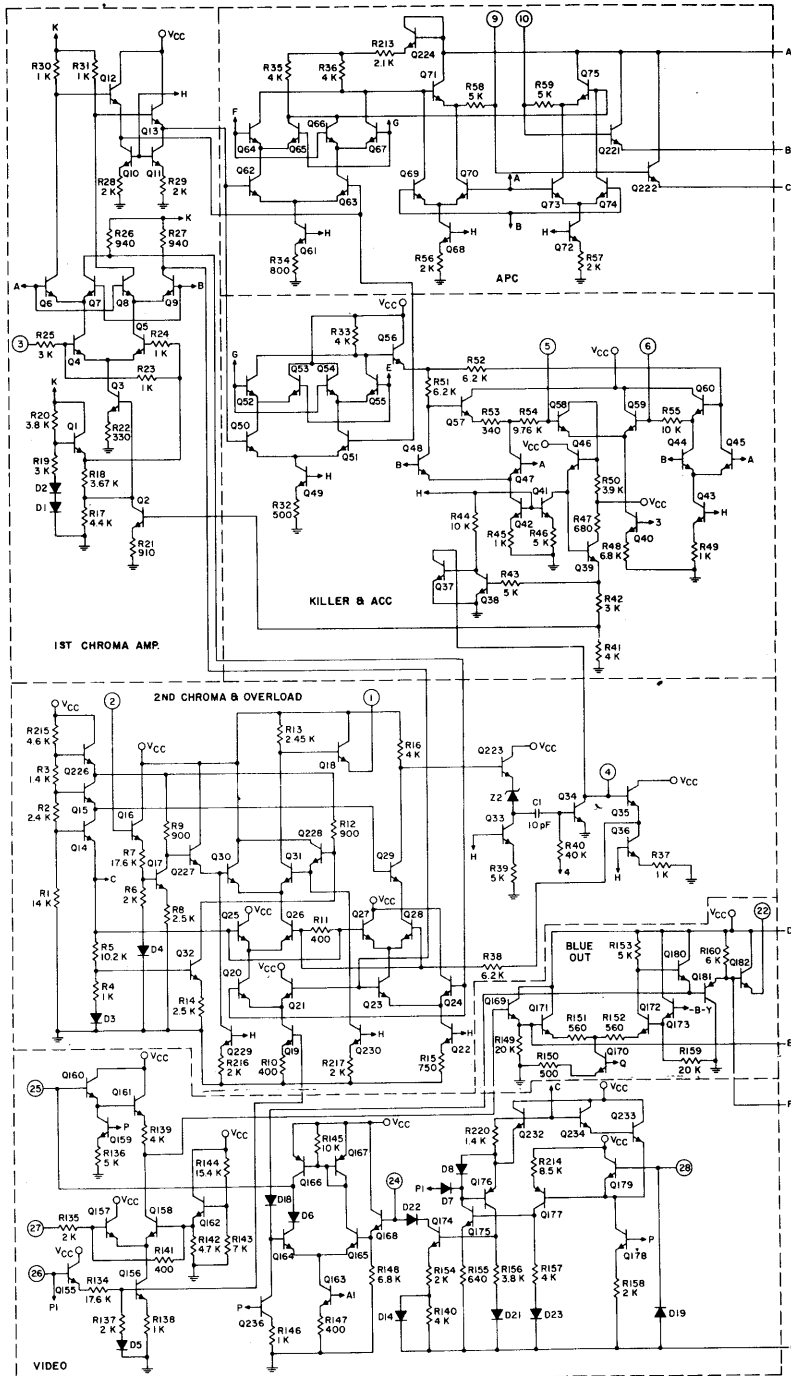
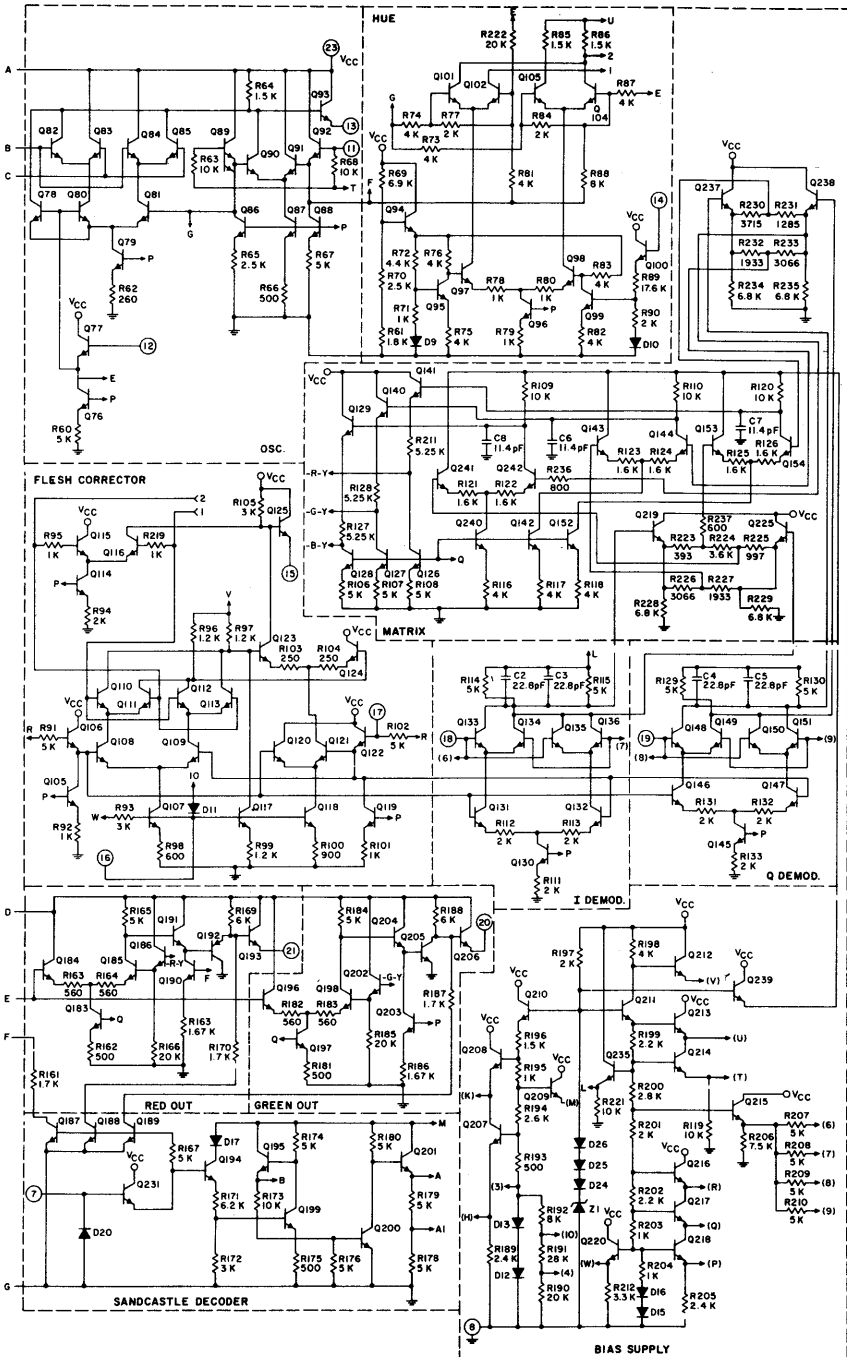


Fig. 2 - Schematic diagram of the CA3217E.
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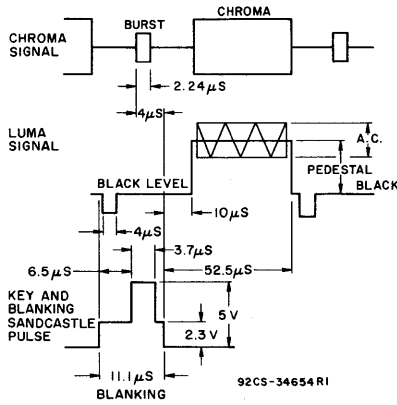


Fig. 5 - Test signals for the CA3217E.

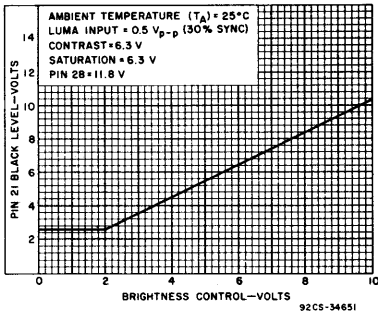


Fig. 6 - Typical P21 black level versus brightness control.

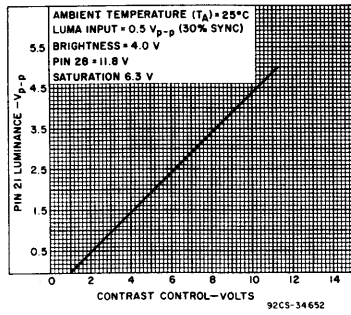


Fig. 7 - Typical P21 luminance output versus contrast control.

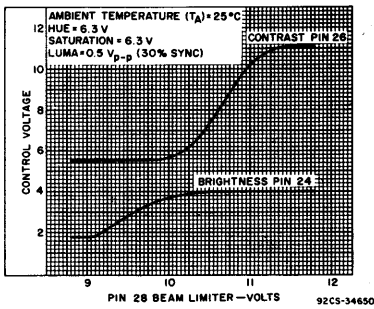


Fig. 8 - Typical beam limiter versus contrast and brightness.

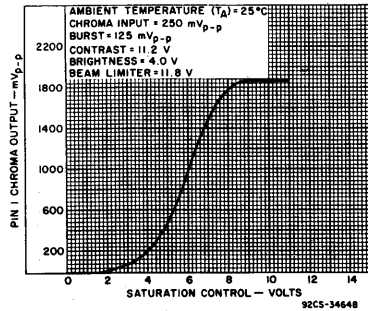


Fig. 9 - Typical P1 chroma output versus saturation control.