SONY

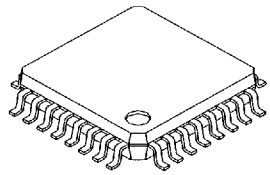
CXA1950Q

RGB and Y Color Difference Decoder

Description

The CXA1950Q is an IC that converts separation signals into RGB signals or Y color difference signals, and can be used with both NTSC and PAL systems.

32 pin QFP (Plastic)



Features

- Chroma signal band: 1.5MHz (typ.)
- Sharpness filter
- Supports both RGB and Y color difference output
- Outputs ACK ON/OFF identification signal
- Outputs line alternate signal
- Compatible with both NTSC and PAL systems
- Low power consumption (120mV, Vcc = 5V)

Absolute Maximum Ratings

• Supply voltage	Vcc	7	V
• Operating temperature	Topr	–20 to +75	°C
• Storage temperature	Tstg	–65 to +150	°C
• Allowable power dissipation	PD	500	mW

Operating Conditions

Supply voltage	4.6 to 5.25 (Typ. 5V)	V

Applications

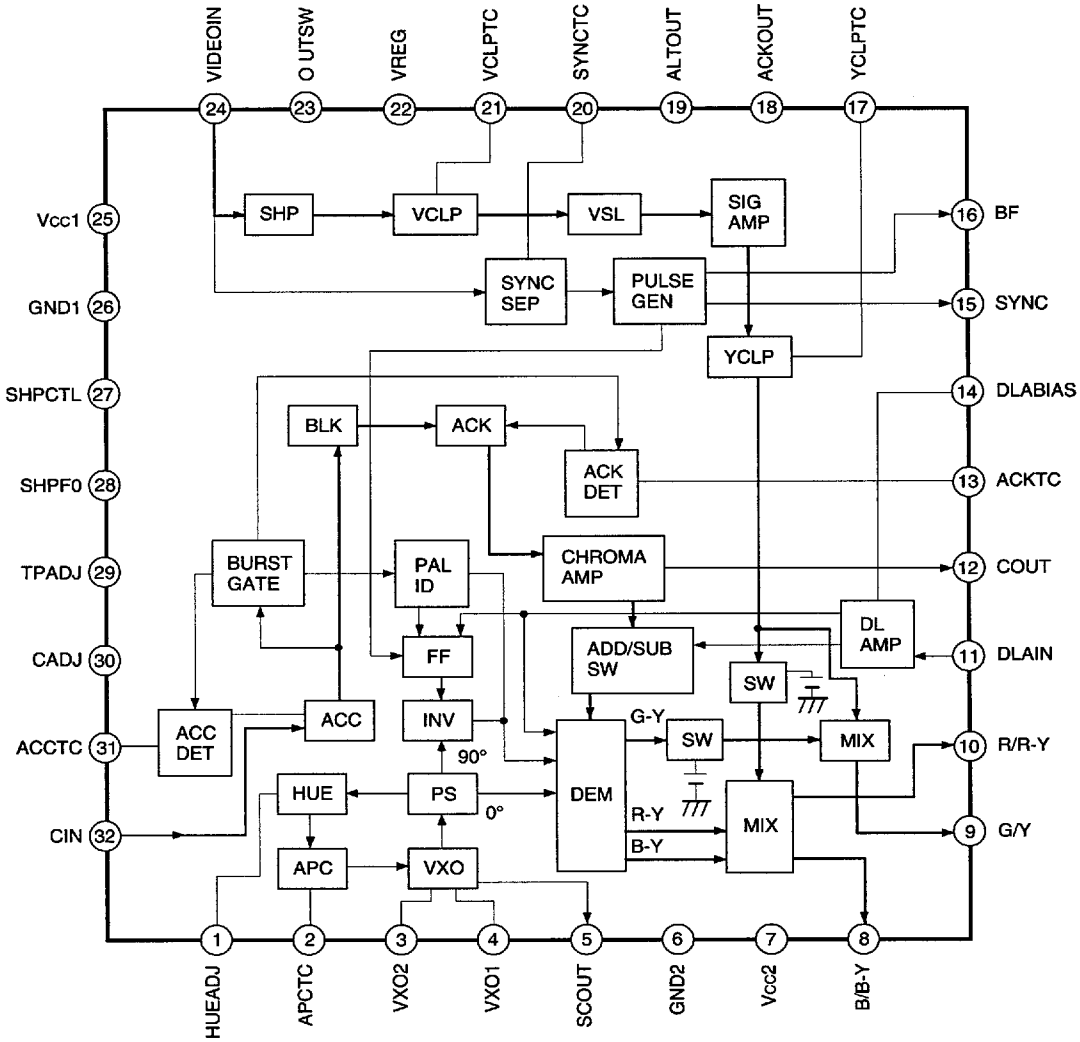
For videos and televisions

Structure

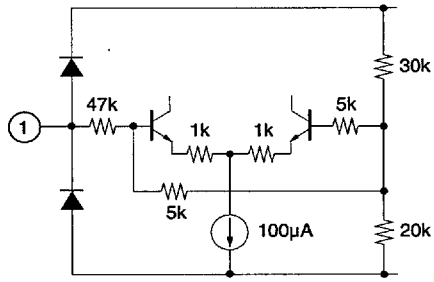
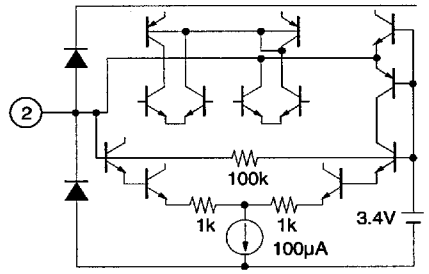
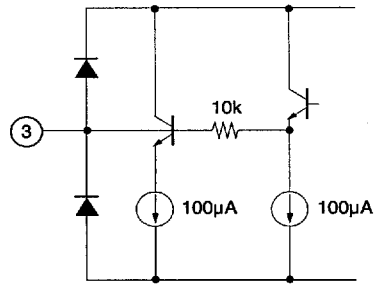
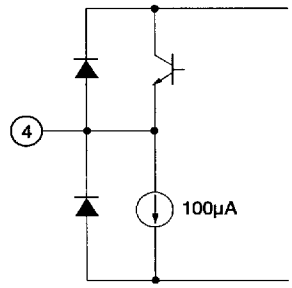
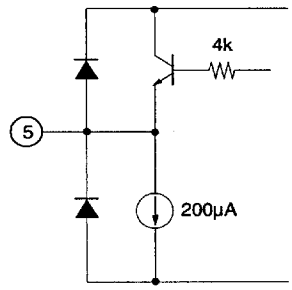
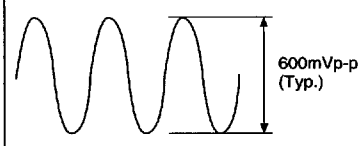
Bipolar silicon monolithic IC

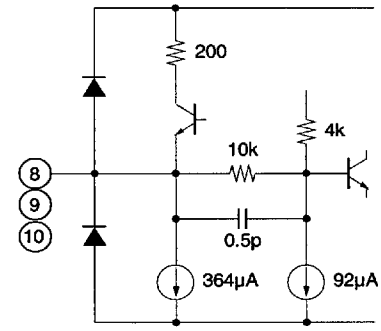
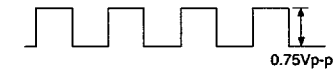
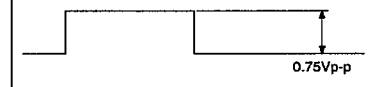
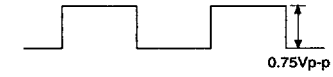
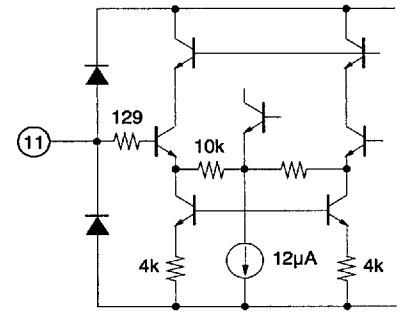
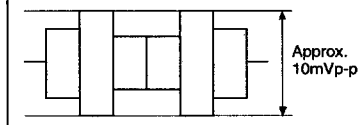
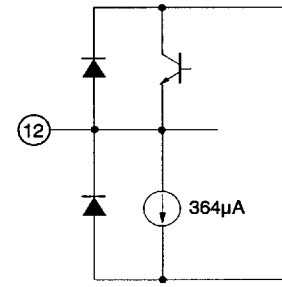
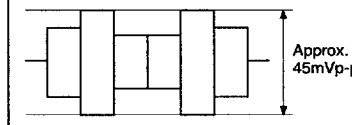
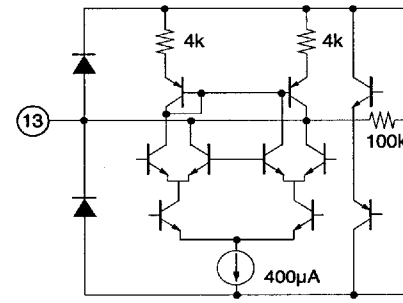
E94Y24A65-PS

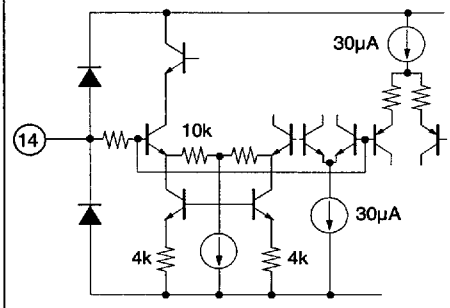
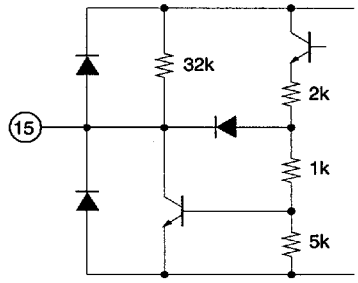
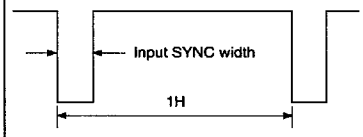
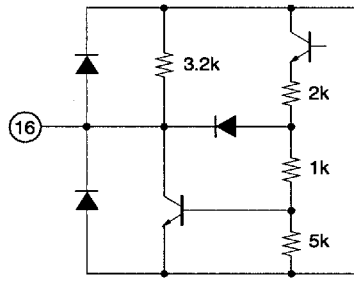
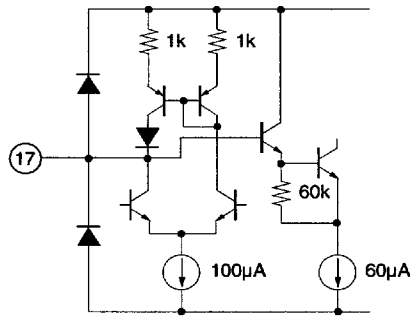
Block Diagram

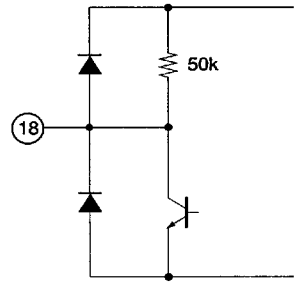
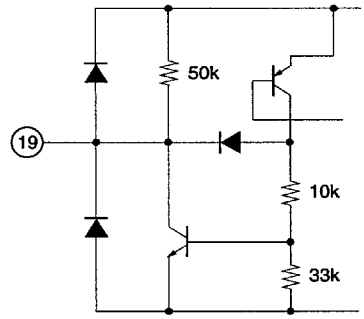
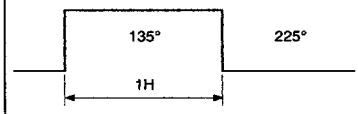
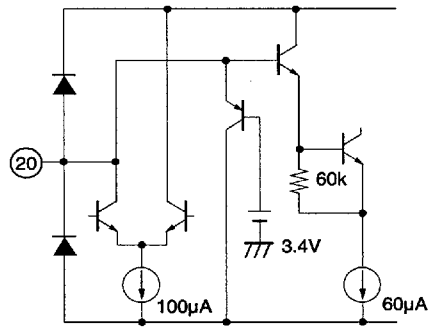
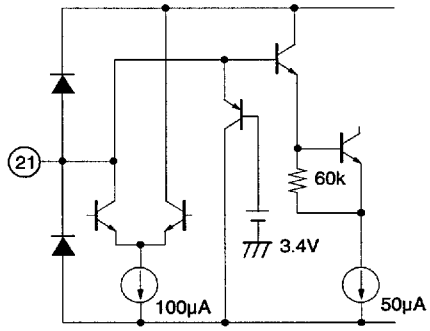


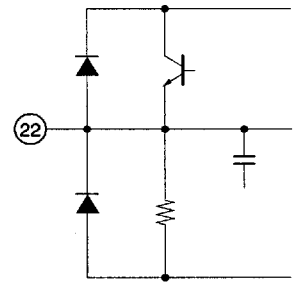
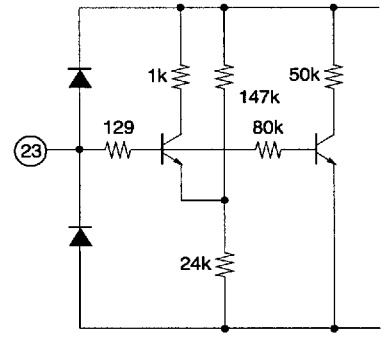
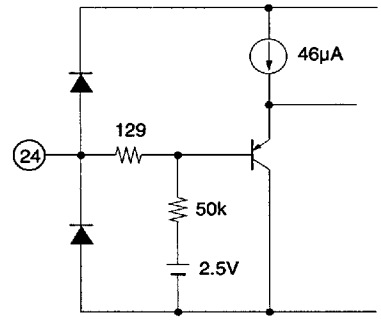
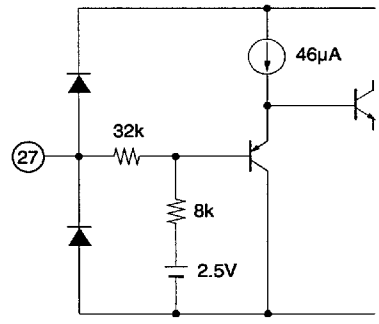
Pin Description

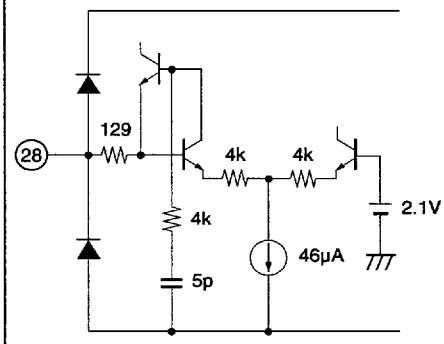
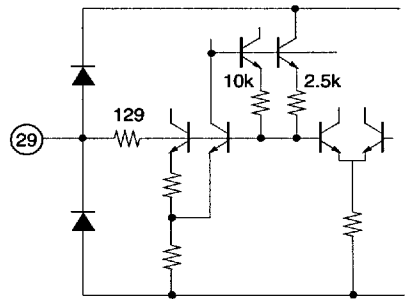
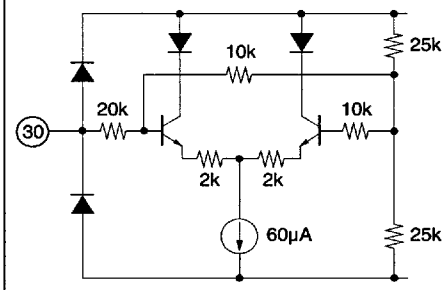
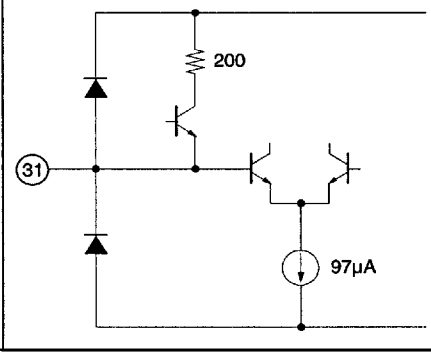
Pin No.	Symbol	Pin voltage	Equivalent circuit	Description
1	HUE ADJ	2.0V		Hue adjustment. The hue can be adjusted by ±10° or more by applying a voltage ranging from 0.5 to 3.5V to this pin. Decouple with a 0.01µF capacitor for PAL mode.
2	APC TC	3.4V		APC (color sync) time constant and free-running frequency adjustment. The VXO free-running frequency can be adjusted by varying the DC voltage applied to this pin.
3	VXO2	3.1V		Crystal oscillator.
4	VXO1	3.2V		Crystal oscillator.
5	SCOUT	1.6V		Subcarrier output. 

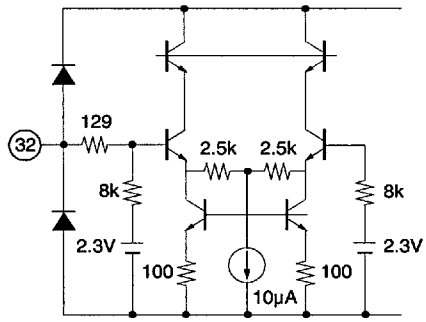
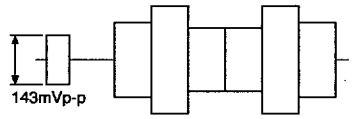
Pin No.	Symbol	Pin voltage	Equivalent circuit	Description
6	GND2	0V		GND for chroma.
7	Vcc2	5V		Vcc for chroma.
8	B/B-Y OUT	1.7V		B output. 75% color bar input, RGB output. 
9	G/Y OUT			G output. 
10	R/R-Y OUT			R output. 
11	DLA IN	0V (NTSC) 2.3V (PAL)		Delay line amplifier input. Connects to GND for NTSC mode; connects the 1H delay line output for PAL mode. 
12	COUT	3.15V		Chroma output for PAL. Connects to Vcc for NTSC mode; connects to the 1H delay line input for PAL mode. 
13	ACK TC	3.1V		ACK (automatic color killer) time constant.

Pin No.	Symbol	Pin voltage	Equivalent circuit	Description
14	DLA BIAS	0V (NTSC) 2.3V (PAL)		NTSC/PAL mode switching and DLAMP gain control. NTSC mode: V14 ≤ 0.8V PAL mode: 2.0V ≤ V14 ≤ 2.6V Variable range: ±2dB or more
15	SYNC	H 5V L 0.2V		Composite sync output. This polarity is negative. 
16	BF	H 5V L 0.2V		Burst flag output. This polarity is negative.
17	YCLPTC			Pedestal clamp time constant.

Pin No.	Symbol	Pin voltage	Equivalent circuit	Description
18	ACKOUT			ACK-ON/OFF identification signal output. A high signal (4V or more) is output in NORMAL mode (when APC is locked), and a low signal (0.5V or less) is output in ACK-ON mode (when APC is not locked).
19	ALTOUT			PAL alternate pulse output. 135° burst: high (4V or more) 225° burst: low (0.5V or less) 
20	SYNC TC	3.1V		Sync tip clamp time constant for sync separation.
21	VCLPTC	3.1V		Pedestal clamp time constant.

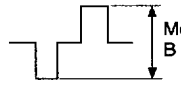
Pin No.	Symbol	Pin voltage	Equivalent circuit	Description
22	VREG	4.2V		4.2V regulator output. Decoupling capacitance is provided. It cannot be used as an external power supply.
23	OUTSW			Output mode switching. High (5V): RGB output Low (0V): Y/color difference output
24	VIDEO IN	2.5V		Y signal input. Standard input level SYNC = 103mVp-p 100% white = 256mVp-p Do not supply the burst signal. 
25	Vcc1	5V		Vcc for Y.
26	GND1	0V		GND for Y.
27	SHPCTL	2.5V		Sharpness gain control. Variable range: −4.5dB to +4.5dB (1.5V ≤ V27 ≤ 3.5V) Adjusts the sharpness level by the voltage supplied to this pin.

Pin No.	Symbol	Pin voltage	Equivalent circuit	Description
28	SHPF0	2.1V		Sharpness filter frequency adjustment. Adjusts the filter f0 by varying the current took out from this pin.
29	TPADJ	1.23V		Sets the timing of the pulses used in the IC. Connects a 27kΩ resistor between this pin and GND. * Use a metal film resistor with an accuracy of ±1%.
30	CADJ	2.5V		Chroma amplifier gain adjustment. Adjusts the gain of chroma amplifier by the voltage (1.5 to 3V) supplied to this pin. Gain variable range: −20dB to +8dB
31	ACCTC			ACC (automatic color control) time constant.

Pin No.	Symbol	Pin voltage	Equivalent circuit	Description
32	CIN	2.3V		Chroma signal input. The standard input level is 143mVp-p of burst amplitude. Always input the signal with low impedance (emitter follower). 

Electrical Characteristics (Ta = 25°C, Vcc = 5V, See the Electrical Characteristics Measurement Circuit.)

Item	Symbol	Conditions	Input signals Y	Input signals C	Measurement point (pin)	Min.	Typ.	Max.	Unit
Current consumption	I_{CC1}	Sum of currents flowing to Vcc1 and Vcc2	1		A	16.0	24.5	34.0	mA
Gain for Y	V_O	F = 300kHz, A = 160mVp-p, L = 160mV. Measures output gain.	1		V9	10.5	12.0	13.5	dB
Cut-off frequency for Y	V_{FC}	F = 5.0MHz, A = 160mVp-p, L = 160mV Measures gain at 300kHz and 3.5MHz.	2		V9	–3.0			dB
Sharpness characteristics Max.	$V_{SHP\,(MAX)}$	F = 1.5MHz, A = 50mVp-p, L = 160mV SHPCTL = 3.5V Ratio of 300kHz and 1.5MHz.	2		V9	5.0			dB
Sharpness characteristics Min.	$V_{SHP\,(MIN)}$	F = 1.5MHz, A = 160mVp-p, L = 160mV SHPCTL = 1.5V	2		V9			–4	dB
Output pedestal level	V_{DC}	Measures pedestal voltage at Pins 8, 9 and 10.	1		V9	1.2	1.8	2.4	V
Color difference output BLK offset	V_{DC}	Measures the pedestal voltage at Pins 8 and 10 and the DC offset during BLK periods.	1		V8 V10	–10	0	10	mV
APC pull-in upper range	Fpu	Inputs fsc +250Hz sine wave and confirms that it is locked with SCOUT (Pin 5).	1	5 8	F5	250			Hz
APC pull-in lower range	Fpd	Inputs fsc –250Hz sine wave and confirms that it is locked with SCOUT (Pin 5).	1	5 8	F5			–250	Hz
ACC cover upper range	Acc1	$Acc2 = \frac{COUT\ (6dB: VA=286mVp\text{-}p)}{COUT\ (0dB: VA=143mVp\text{-}p)}$	1	4 7	V12			3.0	dB
ACC cover lower range	Acc1	$Acc2 = \frac{COUT\ (-14dB: VA=28.6mVp\text{-}p)}{COUT\ (0dB: VA=143mVp\text{-}p)}$	1	4 7	V12	–3.0			dB

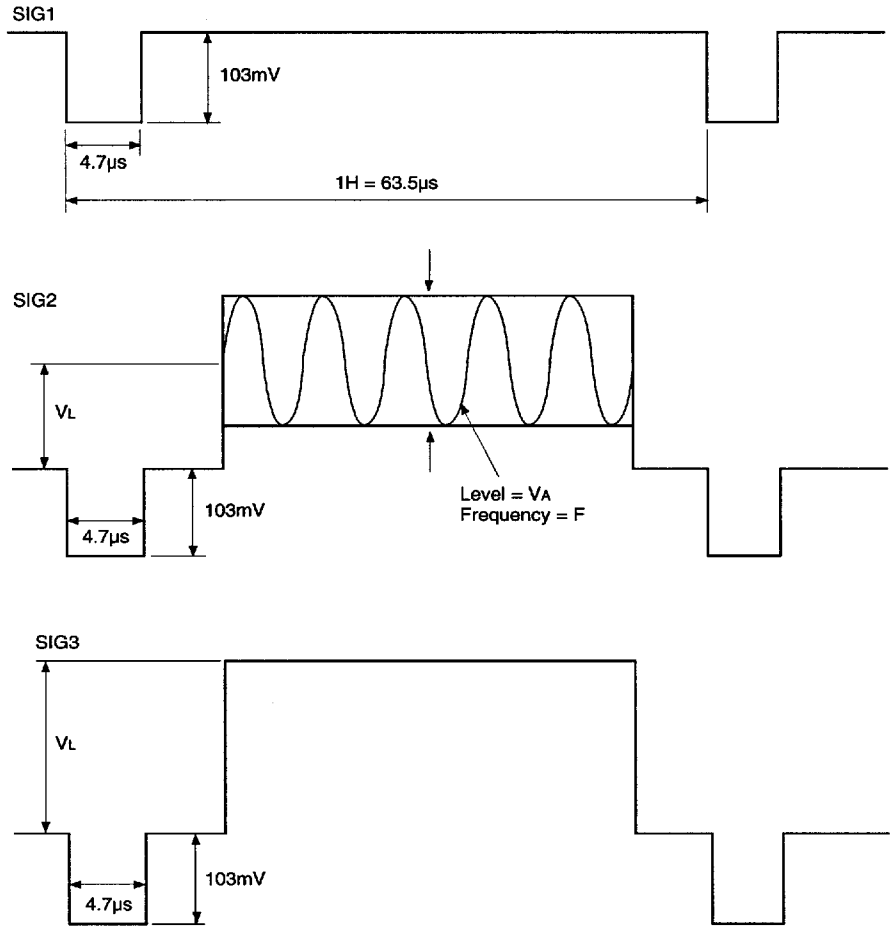
Item	Symbol	Conditions	Input signals Y	Input signals C	Measurement point (pin)	Min.	Typ.	Max.	Unit
Output D range	V_{DL}	CADJ = 3.0V 	1	6 9	V8	1.0			V
Carrier leak	CL	Input signal: SYNC only Measures 3.58MHz component of output.	1		V8			55	mV
NTSC ACK operation	A_{CK1}	With VA = 143mVp-p as 0dB, measures input level (VA) when COUT chroma signal is no longer output, and calculates the ratio of this to when the level is 143mVp-p.	1	4 7	V12	–50		–30	dB
C.SYNC High level	V_{OH}		1		V15	4.0			V
C.SYNC Low level	V_{OL}		1		V15			0.5	V
BF High level	V_{OH}		1		V16	4.0			V
BF Low level	V_{OL}		1		V16			0.5	V
Subcarrier output voltage	$V_{O(SC)}$	Amplitude when frequency at Pin 5 is adjusted to 3.579545MHz ±20Hz.	1		5	500	600		mV

V_{CC1} = 5V, V_{CC2} = 5V, Ta = 25°C

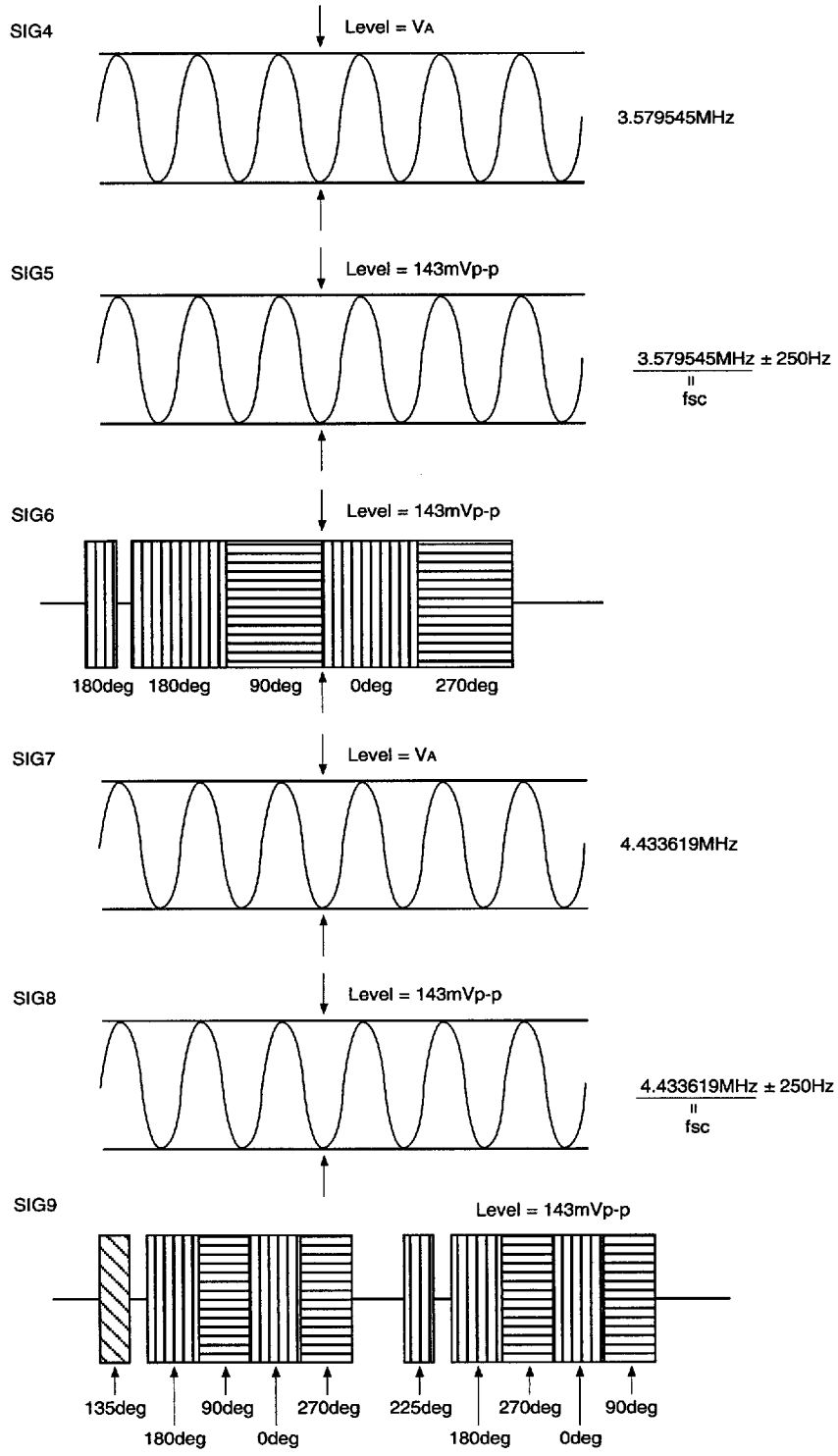
* Default conditions for pin settings SHP F0 = 39kΩ, SHCTL = 2.5V, OUTSW = 0V

Input signals (electrical characteristic input signals)

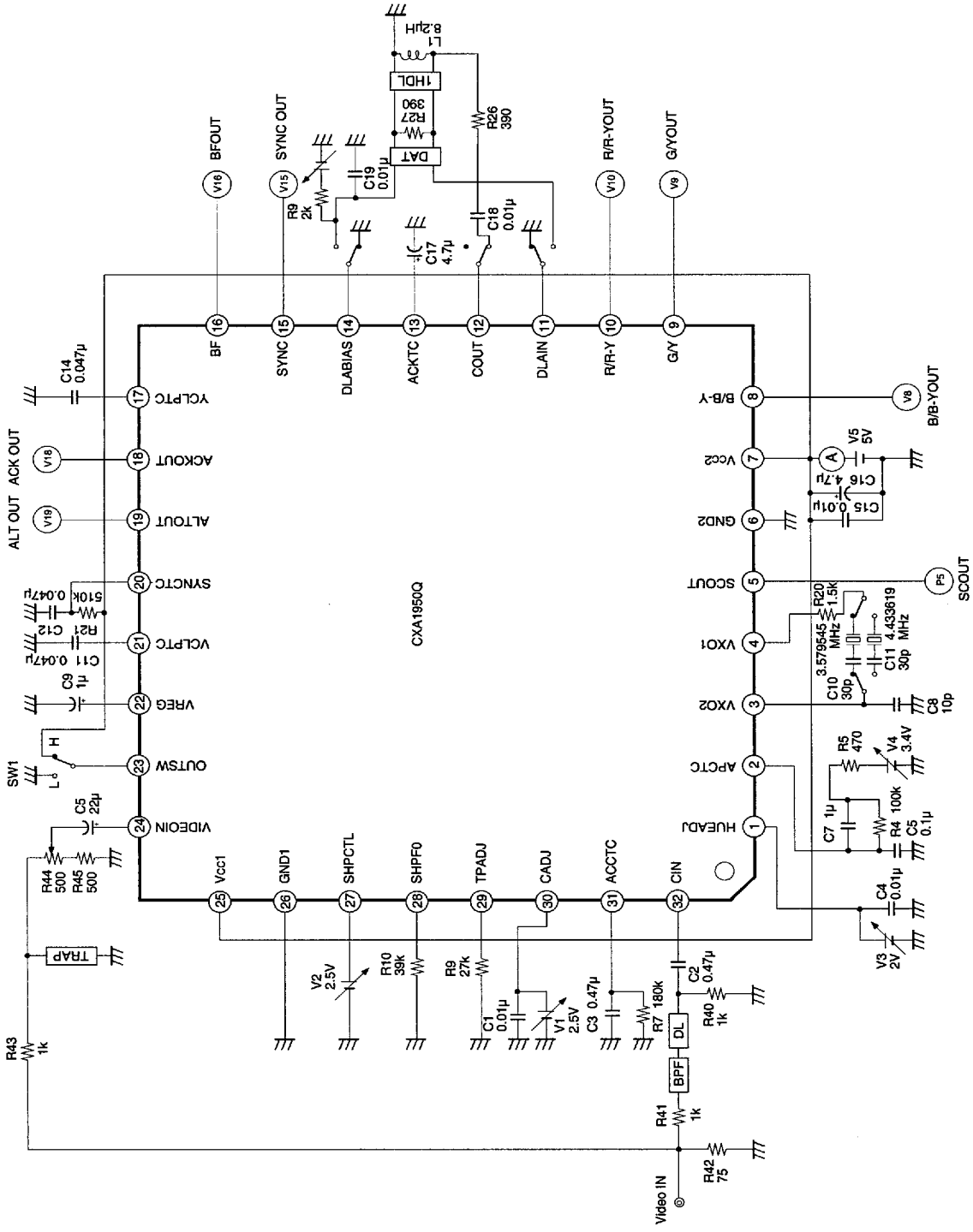
Y input



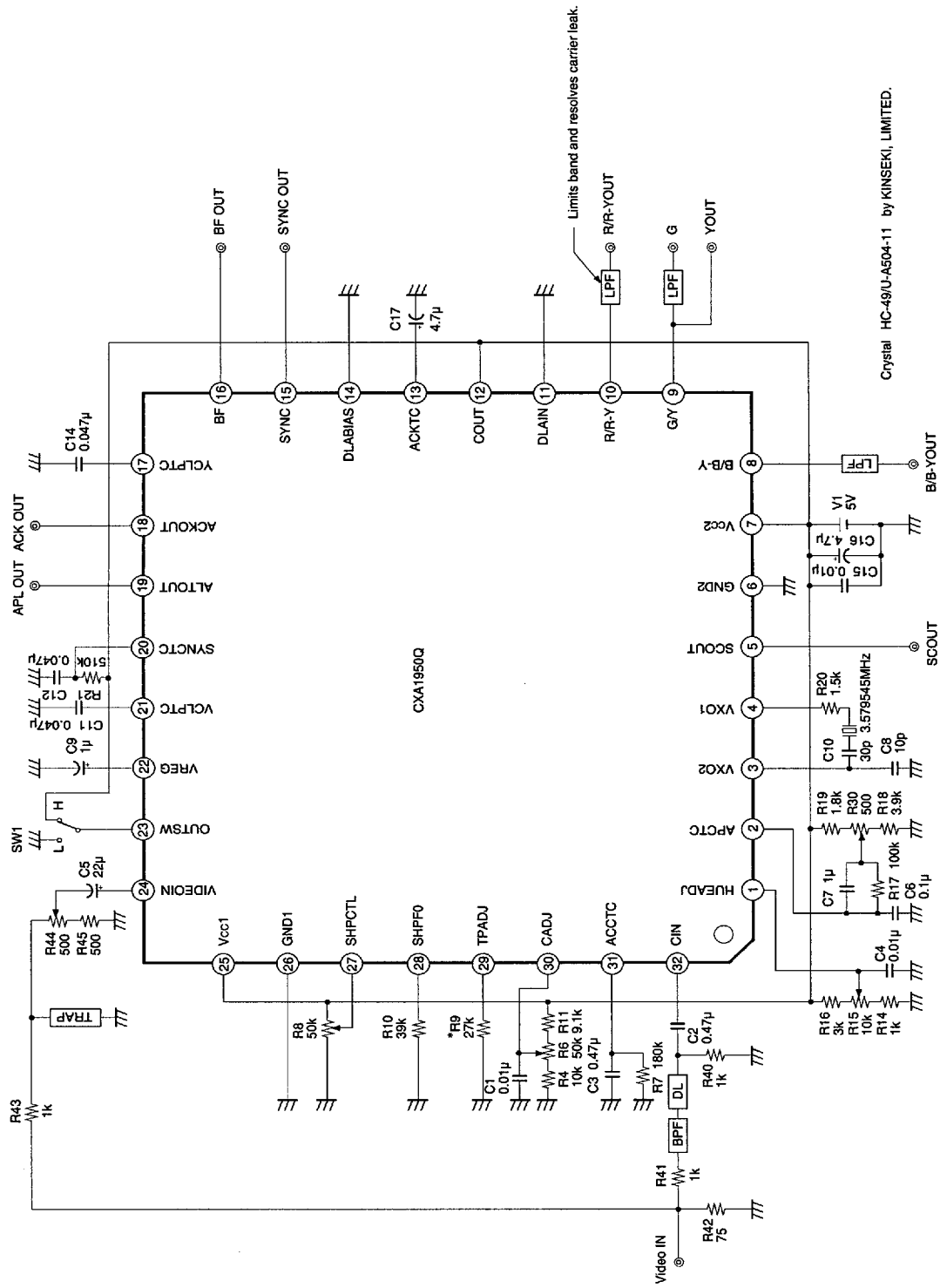
C input



Electrical Characteristics Measurement Circuit

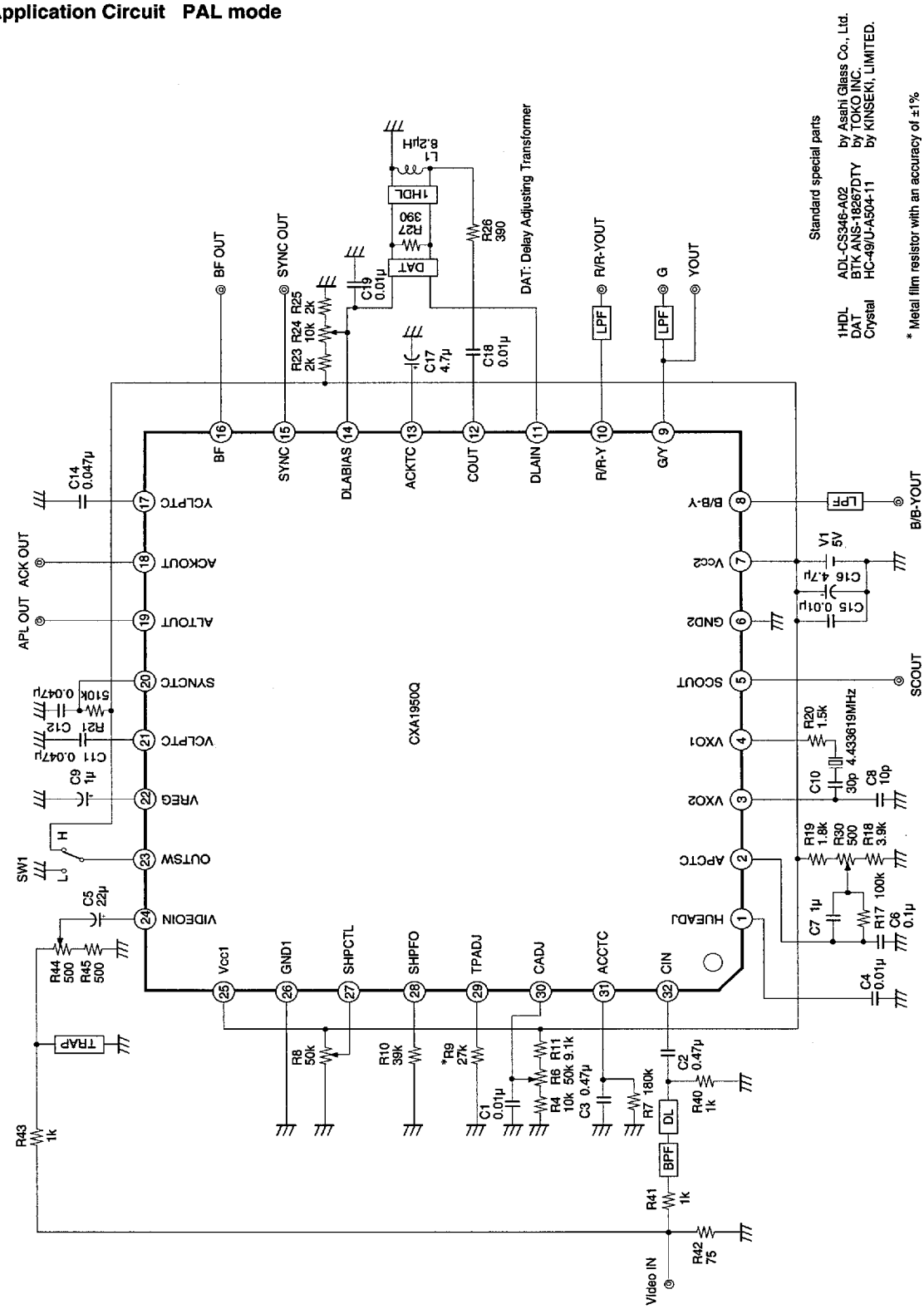


Application Circuit NTSC mode



Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party patent and other right due to same.

Application Circuit PAL mode



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Description of Operation

(1) Luminance signal regeneration system

Sharpness filter

The video (luminance and sync) signals input from Pin 24 (VIDEOIN) are boosted near 1.5MHz by the sharpness filter. The 1.5MHz component can be varied from –4.5 to +4.5dB (as compared to the 300kHz) according to the voltage of Pin 27 (SHPCTL). Approximately 0dB (as compared to the 300kHz) when Pin 27 (SHPCTL) is 2.5V.

Keep Pin 27 open when sharpness is not operated. Since the DC bias in the IC is 2.5V, the frequency response characteristics are almost the same as the characteristics applied 2.5V to Pin 27 externally.

(2) Chrominance signal regeneration system

1) ACC circuit

The chroma signal input from Pin 32 (CIN) is controlled so that the burst signal is detected by ACC DET, feedback is applied to ACC AMP in accordance with the detective output, and the burst level is controlled to be constant.

The chroma signal level (Pin 12) is approximately 45mVp-p for ACC operations.

2) APC circuit

Only the burst signal among the signals whose level has been made constant by ACC AMP enters the APC circuit at the burst gate circuit. 0°, 90° and 180° signals are generated in the phase circuit for the VXO output, and their composite waves (90° carrier) enter the APC circuit passing through the hue circuit.

Here their phase is compared with that of the burst signal and feedback is applied to VXO to obtain a phase difference of 90°. The 0° and 90° carriers created in this way are supplied to B-Y, R-Y and DEM. This means that the demodulation axis can be changed by rotating the phase of the composite waves by the DC voltage at Pin 1 (HUEADJ).

In addition, when APC is locked, Pin 18 (ACKOUT) goes high; when APC is not locked (when ACK is on, etc.) ACKOUT goes low.

3) DEM circuit (NTSC)

The chroma signal whose level has been made constant by ACC AMP is amplified by CHROMA AMP, demodulated by B-Y DEM and R-Y DEM, applied to the Y/C MIX circuit with G-Y created by the resistance matrix, mixed with the luminance signal and then output as the R, G and B primary colors.

Y/color difference output is possible by switching Pin 23 (OUTSW) high/low.

4) DEM circuit (PAL)

The processing is the same as for NTSC until CHROMA AMP. The chroma signal output to Pin 12 (COUT) enters DLAMP from Pin 11 (DLAIN) via 1HDL, its level is controlled, and the signal is applied to the ADD/SUB circuit. The raw signal is added or subtracted in this circuit: the addition signal is applied to B-Y DEM and the subtraction signal to R-Y DEM, and they are demodulated by the 90° carrier whose phase is inverted every 1H and the 0° carrier.

The signals are then mixed with the luminance signal and output as the R, G and B primary colors.

5) PAL ID

In PAL mode, the phase of the 90° carrier is inverted in synchronization with H.SYNC.

Sync detection is conducted to establish whether this matches the input burst. When there is an error, it is corrected by applying feedback to FF (flip-flop).

Note that the alternate pulse is output from Pin 19 (ALTOUT). The pin goes high for 135° burst, and low for 225° burst.

(3) Sync separation system

The sync tip of the video signals input from Pin 24 (Y IN) is clamped and the sync signals are separated. On the basis of the SYNC pulse created here, BF (burst flag), BLK pulse and other timing pulses are generated and supplied to the circuits. The SYNC and BF pulses are output to Pins 15 and 16 via a buffer.

Adjustment Procedure

NTSC mode/RGB output

Input signal: 75% color bar

1) Free-running fo adjustment

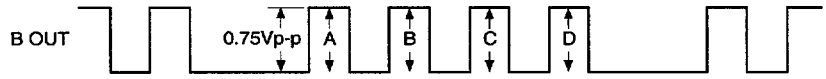
Adjust (R30) the DC voltage at Pin 2 (APCTC) so that the oscillation frequency fsc = 3.579545MHz at Pin 5 (SCOUT) is within ±20Hz under inputting sync condition.

2) Input level adjustment

Adjust the input level so that the white peak (75% white) is set to 0.75Vp-p at the B output.

3) HUEADJ, CADJ adjustment

Adjust HUEADJ (Pin 1) and CADJ (Pin 30) so that the colors (A, B, C and D in the figure below) of the B output amplitude are set to the same amplitude.



NTSC mode/Y color difference output

Input signal: 75% color bar

1) Free-running fo adjustment

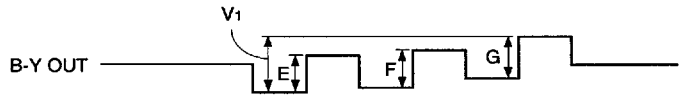
Adjust (R30) the DC voltage at Pin 2 (APCTC) so that the oscillation frequency fsc = 3.579545MHz at Pin 5 (SCOUT) is within ±20Hz under inputting sync condition.

2) Input level adjustment

Adjust the input level so that the white peak (75% white) is set to 0.75Vp-p at the Y output.

3) HUEADJ, CADJ adjustment

Adjust HUEADJ (Pin 1) and CADJ (Pin 30) so that the B-Y output amplitudes E, F, and G are set to the same amplitude and so that V_1 is 1.34Vp-p.



PAL mode

Input signal: 75% color bar

1) Free-running fo adjustment

Adjust (R30) the DC voltage at Pin 2 (APCTC) so that the oscillation frequency (subcarrier) fsc = 4.433619MHz at Pin 5 (SCOUT) is within ±20Hz under inputting sync condition.

2) Input level adjustment

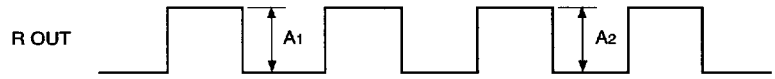
Adjust the input level so that the white peak (75% white) is set to 0.75Vp-p at the B output.

3) DLAMP adjustment

Adjust Pin 14 (DLABIAS) and DAT alternately so that the R output amplitudes (A_1 and A_2) are equal for the H periods before and after.

4) CADJ adjustment

Adjust CADJ so that the colors of the R output amplitude are set to 0.75Vp-p.



PAL mode/Y color difference output

1) Free-running fo adjustment

Adjust (R30) the DC voltage at Pin 2 (APCTC) so that the oscillation frequency fsc = 4.433619MHz at Pin 5 (SCOUT) is within ±20Hz under inputting sync condition.

2) Input level adjustment

Adjust the input level so that the white peak (75% white) is set to 0.75Vp-p at the Y output.

3) CADJ adjustment

Adjust CADJ so that the B-Y output amplitude is 1.34Vp-p.

4) DLAMP adjustment

Adjust Pin 14 (DLABIAS) and DAT alternately so that the R-Y output amplitudes (B_1 and B_2) are equal for the H periods before and after.

Applications

1. The input dynamic range is 0.36Vp-p (max.).
   The breakdown is given as follows.

YIN (Pin 24)	Sync signal	0.103Vp-p
	Luminance signal	0.256Vp-p (100% white)
CIN (Pin 32)	Burst signal	0.143Vp-p

   Note that when the input signal exceeds the value of 0.36Vp-p from sync tip to white peak, the output may be clipped and flattened.

2. The center frequency for the sharpness varies according to the resistor connected to Pin 28. The variation is –40MHz/kΩ, and the standard value is approximately 1.5MHz for 39kΩ.

3. The chroma signal is delayed by 200ns compared to the luminance signal within the IC.

4. Demodulation axis and detective output ratio
   The standard values are given below as referenced to the B-Y axis.

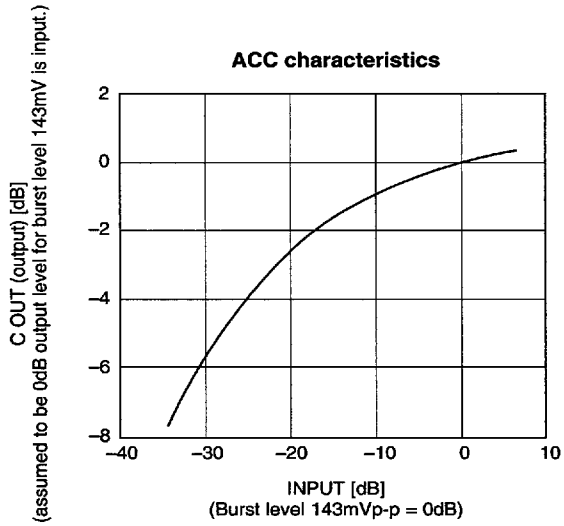
	Demodulation axis	Detective output ratio
R-Y axis	88°	0.57
G-Y axis	235°	0.37

5. Simple PAL system
   When used with the simple PAL system, set Pin 14 (DLABIAS) to PAL mode, and decouple Pin 11 (DLAIN) and Pin 12 (COUT) with a 0.01μF capacitor.

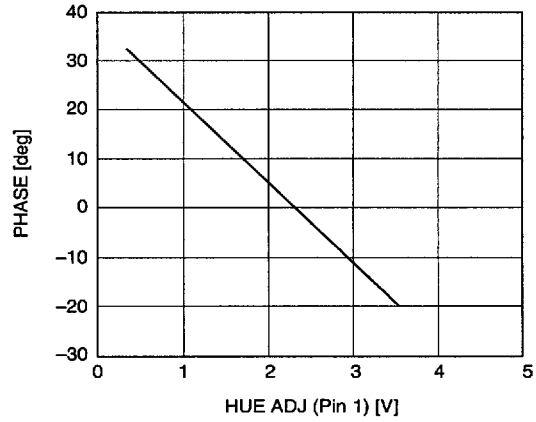
6. Notes on Operation
   1) Be sure to wire X'tal (crystal oscillator) as close to the IC and as short as possible since fo varies depending on floating capacitance and other factors. Also, take particular care with the routing of the Vcc and GND leads. Use a decoupling capacitor for Vcc and others with a superior performance and attach it as close to the IC as possible.
   2) Be sure to input the chroma signal to the chroma signal input pin (Pin 32, CIN) with low impedance (emitter follower).
   3) Because the chroma signal band has been extended, carrier leak is greater than in the CXA1585Q. When using this IC, insert a filter with characteristics suited for the application into the output.

Example of Representative Characteristics

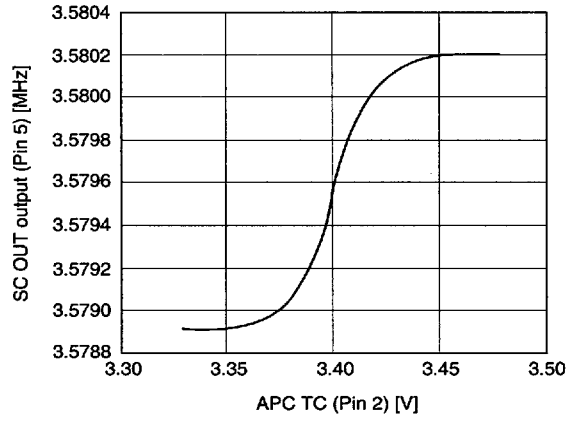
ACC characteristics



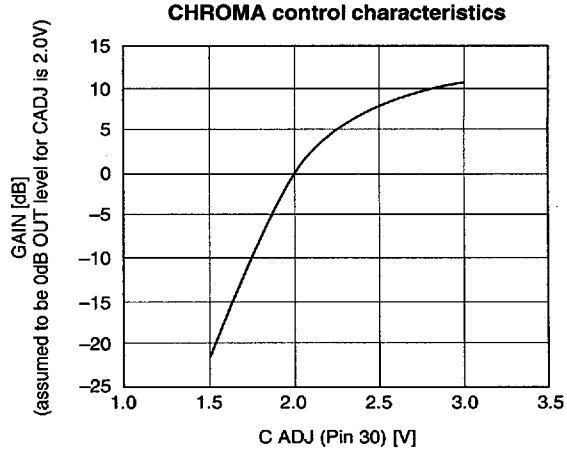
HUE control characteristics



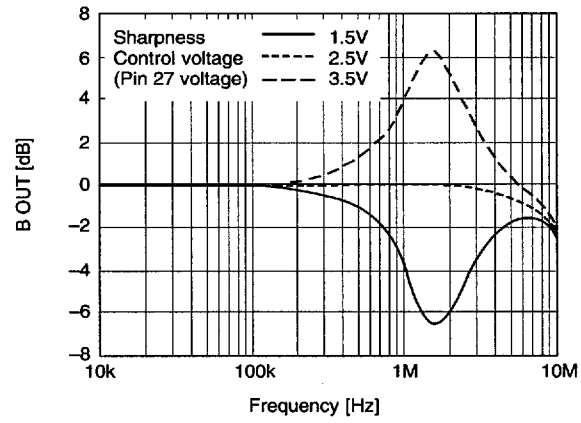
Free-running frequency



CHROMA control characteristics

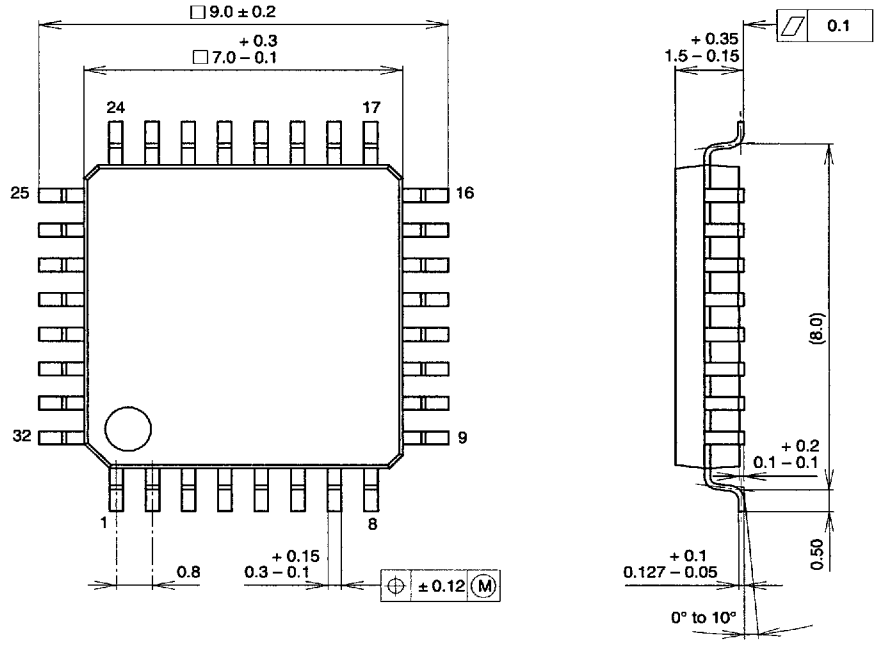


Sharpness control characteristics



Package Outline Unit: mm

32PIN QFP (PLASTIC)



SONY CODE	QFP-32P-L01
EIAJ CODE	*QFP032-P-0707-A
JEDEC CODE	————

PACKAGE MATERIAL	EPOXY RESIN
LEAD TREATMENT	SOLDER PLATING
LEAD MATERIAL	42 ALLOY
PACKAGE WEIGHT	0.2g