BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC1423

FOR COLOR TV COLOR SIGNALS, VIDEO SIGNAL, AND SYNCHRONIZING SIGNAL OF PAL/NTSC SYSTEM

The μPC1423 semiconductor integrated circuit processes color TV color signals, video signals, and synchronizing signals of the PAL/NTSC system. It enables color synchronization (APC), horizontal synchronization (H-HOLD), and vertical synchronization (V-HOLD) to be completely adjustment free, thus greatly reducing the number of peripheral parts and the number of adjustments.

The μPC1423 is contained in a 48 pin shrink DIP package suited to high-density mounting.

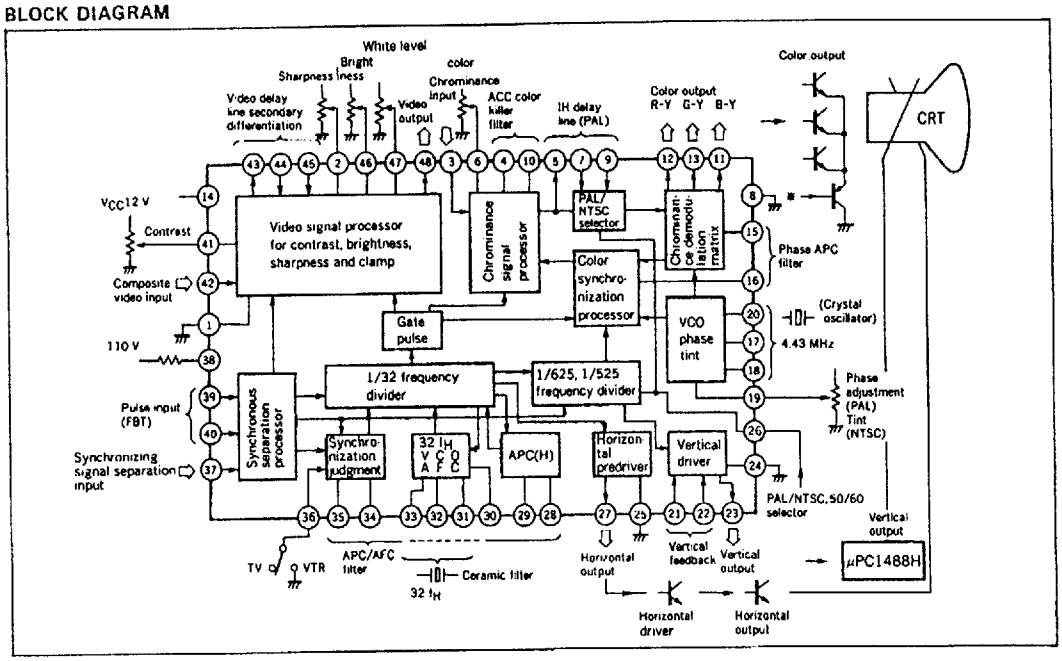
FEATURES

- Completely adjustment-free color synchronization and horizontal/vertical synchronization
- Clear picture with secondary differentiation of video
- Horizontally double AFC enables stable synchronization even with VTR
- PAL/NTSC mode selectable

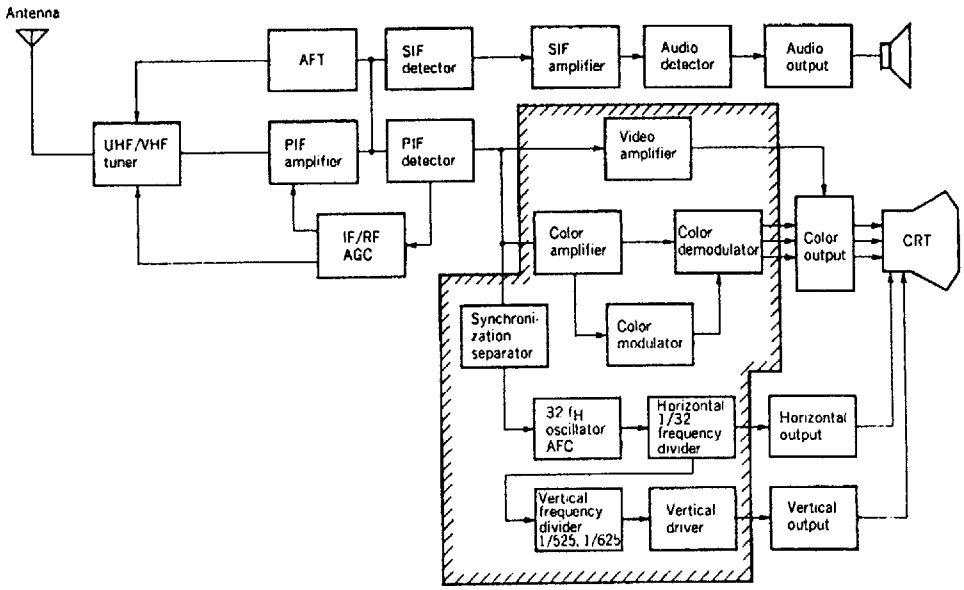
ORDER INFORMATION

Part Number	Package
μPC1423CA(1)	48PIN PLASTIC SHRINK DIP (600 mil)

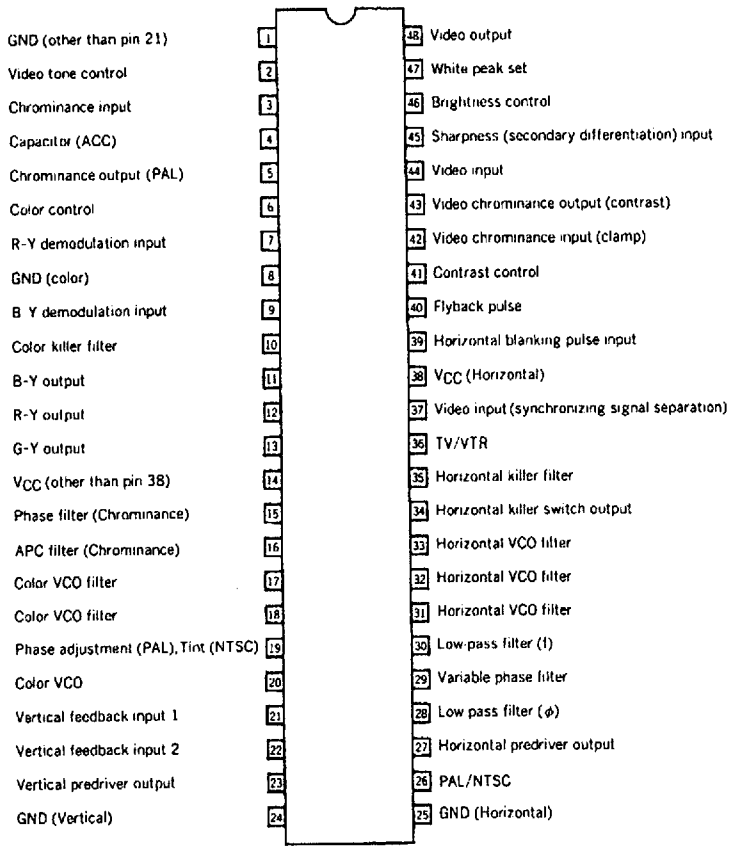
BLOCK DIAGRAM



TV BLOCK DIAGRAM



PIN CONFIGURATION (Top View)



ABSOLUTE MAXIMUM RATINGS (T_a = 25 °C)

Supply Voltage	V_{14}, V_{38}	13.5	V
Input Signal Voltage (Video)	$e_{i42,44}$	5	V_{p-p}
Input Signal Voltage (Chrominance)	$e_{i3,7,9}$	5	V_{p-p}
Input Signal Voltage (Deflection)	e_{i37}	5	V_{p-p}
Input Signal Voltage (Sharpness)	e_{i45}	8	V_{p-p}
Pulse Input Voltage	$e_{p39,40}$	V_{14}	V_p
Feedback Input Voltage	$e_{i21,22}$	e_{i21}: 7 V_p e_{i22}: V_{14}	V_p
Control Signal Voltage	$e_{c2,6,19,26,44,46,47}$	V_{14}	V
Output Current (Video)	I_{o48}	−50 (V_{48} < 5 V)	mA
Output Current (Color Differential)	$I_{o11,12,13}$	+10	mA
Output Current (Horizontal)	I_{o27}	−10	mA
Output Current (Vertical)	I_{o23}	+10	mA
Output Current (Video, Chrominance)	I_{o5}	+10	mA
Output Current (Video, Chroma)	I_{o43}	+10	mA
Package Allowable Loss	P_D	1.5 (T_a = 60 °C)	W
Operating Temperature	T_{opt}	−10 to +60	°C
Storage Temperature	T_{stg}	−40 to +150	°C

RECOMMENDED OPERATION RANGE (T_a = 25 °C)

CHARACTERISTIC	SYMBOL	RECOMMENDED VALUE	UNIT
Supply Voltage	$V_{14,38}$	12 ±1	V
Composite Video Input Signal (negative sync.)	$e_{i37,42}$	1	V_{p-p}
Chrominance Input Signal (Burst Signal)	e_{i3}	200	mV_{p-p}
Blanking/Flyback Pulse Input Voltage	$e_{p39,40}$	MIN. 7	V_p
Contrast Control Voltage	V_{41}	4 to 5	V_{DC}
Brightness Control Voltage	V_{46}	7 to 9	V_{DC}
Sharpness Control Voltage	V_2	4 to 5	V_{DC}
Color Control Voltage	V_6	4 to 6	V_{DC}
Tint Control Voltage	V_{19}	4 to 6	V_{DC}
System Selector Voltage (PAL)	V_{26}	GND to 0.5	V_{DC}
System Selector Voltage (NTSC60)	V_{26}	2 to V_{14}	V_{DC}
TV/VTR Selector Voltage	V_{36}	TV: Open VTR: GND to 0.5 V	
Horizontal Output Current	I_{o27}	−2 to +1	mA
Video Output Voltage (Black Level)	E_{OY}	6	V_{DC}

ELECTRICAL CHARACTERISTICS (T_a = 25 ±3 °C, V_{CC} = 12 V)

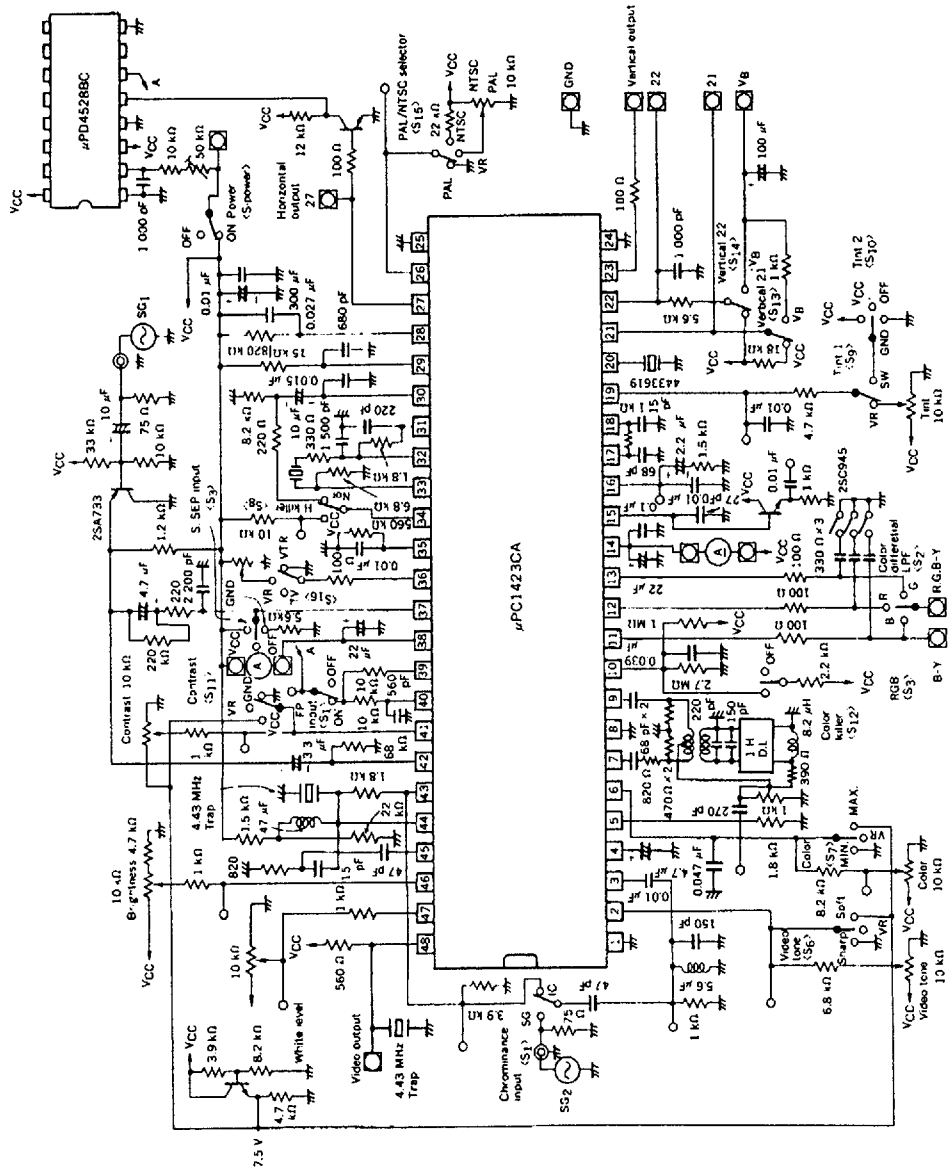
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Circuit Current	I_{CC14P}	45	60	85	mA	V_{CC} = 12 V, Pin 14
Circuit Current	I_{CC38}	8	12	16	mA	V_{CC} = 12 V, Pin 38
ACC Amplitude Characteristic 1	ACC_1	−3	0	+3	dB	Chrominance input (pin 3) burst signal, 0 dB (200 mV_{p-p}) to +6 dB (400 mV_{p-p}), B−Y output (pin 11) level variation.
ACC Amplitude Characteristic 2	ACC_2	−7	−3	+2	dB	Chrominance input (pin 3) burst signal, 0 dB (200 mV_{p-p}) to −20 dB (20 mV_{p-p}), B−Y output (pin 11) level variation.
Color Killer Set Point	e_{KP}	−43	−37	−31	dB	Chrominance input (pin 3) burst signal 0 dB (200 mV_{p-p}) → Input level with killer on after attenuation, Input level at which B−Y output is eliminated.
e_{KN} Supply Voltage Variation	e_{KP} (V_{CC})		0	±3	dB	V_{CC} = 12 ±1 V, identical to e_{KN}, Variation level from e_{KN} (V_{CC} = 12 V).
e_{KP} Ambient Temperature Variation	e_{KP} (T)			±4	dB	T_a = 25 ±35 °C, identical to e_{KP}, Variation level from e_{KP} (T_a = 25 °C).
Chrominance Output DC Voltage	$E_{5(OFF)}$	6.0	7.0	8.0	V_{DC}	Chrominance input (pin 3) burst signal 200 mV_{p-p}, Chrominance output terminal DC voltage.
Color Killer Remaining Color	e_{o1P}			50	mV_{p-p}	Chrominance input (pin 3) burst signal 0 dB (200 mV_{p-p}) to B−Y output (pin 11) remaining level with killer on after-attenuation.
Color Control Remaining Color	e_{o2P}		300	600	mV_{p-p}	Chrominance input (pin 3) burst signal 200 mV_{p-p}, B−Y output (pin 11) remaining level at color MIN.
Total Color Differential Output	e_{o3P}	1.4	2.4	3.4	V_{p-p}	Chrominance input (pin 3) burst signal 200 mV_{p-p}, B−Y output (pin 11) level at color V_6 = 4.3 V.
B−Y Demodulation Output Supply Voltage Variation	e_{oBP} (V_{CC})			±25	%	V_{CC} = 12 ±1 V burst signal 200 mV_{p-p}, Level variation from B−Y output 2.9 V_{p-p} at V_{CC} = 12 V.
B−Y Demodulation Output Ambient Temperature Variation	e_{oBP} (T)			±15	%	T_a = 25 ±35 °C, identical to e_{03P}, Level variation from B−Y output 2.9 V_{p-p} at T_a = 25 °C.
Maximum Demodulation Output	e_{oMP}	4.8	5.6		V_{p-p}	Chrominance input (pin 3) burst signal 200 mV_{p-p}, B−Y output (pin 11) level at color Max.
Variable Phase Range	±βP	Phase must be adjusted.				TINT VR GND for the phase of B−Y output with TINT VR off, Phase variation in each V_{CC}.
Color Differential Output Contrast Control	e_{oC} (CONTRAST)	20			dB	Chrominance input (pin 3) burst signal 200 mV_{p-p}, B−Y output variation at the minimum contrast when B−Y output is set to 2.9 V_{p-p} (maximum contrast)
Subcarrier Output	e_{scp}	0.6	1.0		V_{p-p}	Chrominance input (pin 3) burst signal 200 mV_{p-p}, CW level is measured through the emitter follower (pin 15).
Variable VCO Range	f_{sc1P}	+0.4	+0.6	+1.1	kHz	No signal (pin 42), Difference between the VCO frequency and 4 433.619 kHz at V_{16} = 2 V.
	f_{sc2P}	−0.7	−1.1	−1.6	kHz	No signal (pin 42), Difference between the VCO frequency and 4 433.619 kHz at V_{16} = 10 V.
Sweep Amplitude 1	V_{16HP}	6.4	6.8	7.2	V	Only the synchronizing signal (pin 42): 0.3 V_{p-p}, APC filter (pin 16): High 
Sweep Amplitude 2	V_{16LP}	4.6	5.0	5.4	V	Only the synchronizing signal (pin 42): 0.3 V_{p-p}, APC filter (pin 16): Low. 

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Demodulation Output Ratio 1	R–Y/ B–Y	0.54	0.61	0.68	V/V	Chrominance input (pin 3) burst signal 200 mV_{p-p}, chrominance signal 4.44 MHz/200 mV_{p-p}. Output ratio between B–Y output (pin 11) and R–Y output (pin 12) in PAL mode.
Demodulation Output Ratio 2	G–Y/ B–Y	0.30	0.37	0.44	V/V	Chrominance input (pin 3) burst signal 200 mV_{p-p}, chrominance signal 4.44 MHz/200 mV_{p-p}. Output ratio between B–Y output (pin 11) and G–Y output (pin 13) in PAL mode.
Demodulation Angle 1	$\angle$R Y	85	90	95	deg.	Chrominance input (pin 3) burst signal 200 mV_{p-p}, R–Y phase difference from R–Y.
Demodulation Angle 2	$\angle$G–Y	223	233	243	deg.	Chrominance input (pin 3) burst signal 200 mV_{p-p}, G–Y phase difference from B–Y.
Color Differential Output DC Voltage	E_{OP}	6.6	7.1	7.6	V	No signal (pin 3), DC voltage of B–Y output (pin 11), G–Y output (pin 13), and R–Y output (pin 12).
E_{OP} Ambient Temperature Variation	ΔE_{OP} (T)		0	±2	mV/°C	T_a = −10 to +60 °C, Variation of B–Y, G–Y, and R–Y output DC voltages identical to $E_{OP}/70$ °C.
E_O(R–Y) Line Variation	$E_{O}R-Y$ n–(n+1)		0	25	mV	No signal (pin 3), R–Y output (pin 12) DC voltage difference between lines n and n+1.
DC Voltage Difference between Color Differential Output DC Voltages	$E_{(x-y)P}$		0	±200	mV	No signal (pin 3), voltage differences between pins 11 and 12 and between pins 11 and 13.
$E_{(X-Y)P}$ Supply Voltage Variation	$\Delta E_{(x-y)P}$ (V_{CC})		0	50	mV	V_{CC} = 11 to 13 V, Variation of voltage differences $E_{(X-Y)P}$.
$E_{(X-Y)P}$ Ambient Temperature Variation	$\Delta E_{(x-y)P}$ (T)		0	±1	mV/°C	T_a = −10 to +60 °C, Variation of voltage difference identical to $E_{(X-Y)P}/70$ °C.
Carrier Level Remaining in Color Differential Output	e_{carP}		80	200	mV_{p-p}	No signal (pin 3), Carrier leak level including higher harmonics) in the scanning periods of B–Y output (pin 11), G–Y output (pin 13), and R–Y output (pin 12).
Higher Harmonic Level Remaining in Color Differential Output	C_{harP}		100	300	mV_{p-p}	Chrominance input (pin 3) burst signal 200 mV_{p-p}. Higher harmonic level (including the carrier component) in color differential outputs B–Y output (pin 11), G–Y output (pin 13), and R–Y output (pin 12).
Contrast Amplifier Stage Voltage Gain	A_{V1}	6.0	7.5	9.0	dB	Video input (pin 42) stair step 1 V_{p-p}. Voltage gain is calculated from the video output (pin 43) level at maximum contrast.
Contrast Amplifier Stage Video Output	e_{ox}	2.0	2.5	3.0	V_{p-p}	Video input (pin 42) stair step 1 V_{p-p}. Video output (pin 43) level at contrast V_{41} = 5.1 V.
Contrast Control Range	e_{ox} (CONTRAST)	20			dB	Video input (pin 42) stair step 1 V_{p-p}. Variable range of the video output (pin 43) level between the maximum contrast and minimum contrast.
Video Output DC Voltage Variation with Contrast	ΔE_{OY} (CONTRAST)		0	±50	mV	Video input (pin 42). Only the synchronizing signal (black) is 0.3 V_{p-p}. DC level variation in the scanning period of video output (pin 48) between the maximum contrast and minimum contrast.
Contrast Amplifier Stage Differential Gain	DG			5	%	Video Input (pin 42). DG measurement stair step 1 V_{p-p}. DG of video output (pin 43) is measured.
Contrast Amplifier Stage Differential Phase	DP			5	deg.	Video input (pin 42). DP measurement stair step 1 V_{p-p}. DP of video output (pin 43) is measured.
Contrast Amplifier Stage Frequency Characteristic	f_Y	−3	0		dB	0.6 V_{p-p} video output (pin 42) including the sine wave 200 kHz/4.2 MHz synchronizing signal of video input (pin 43), Gain ratio at each frequency

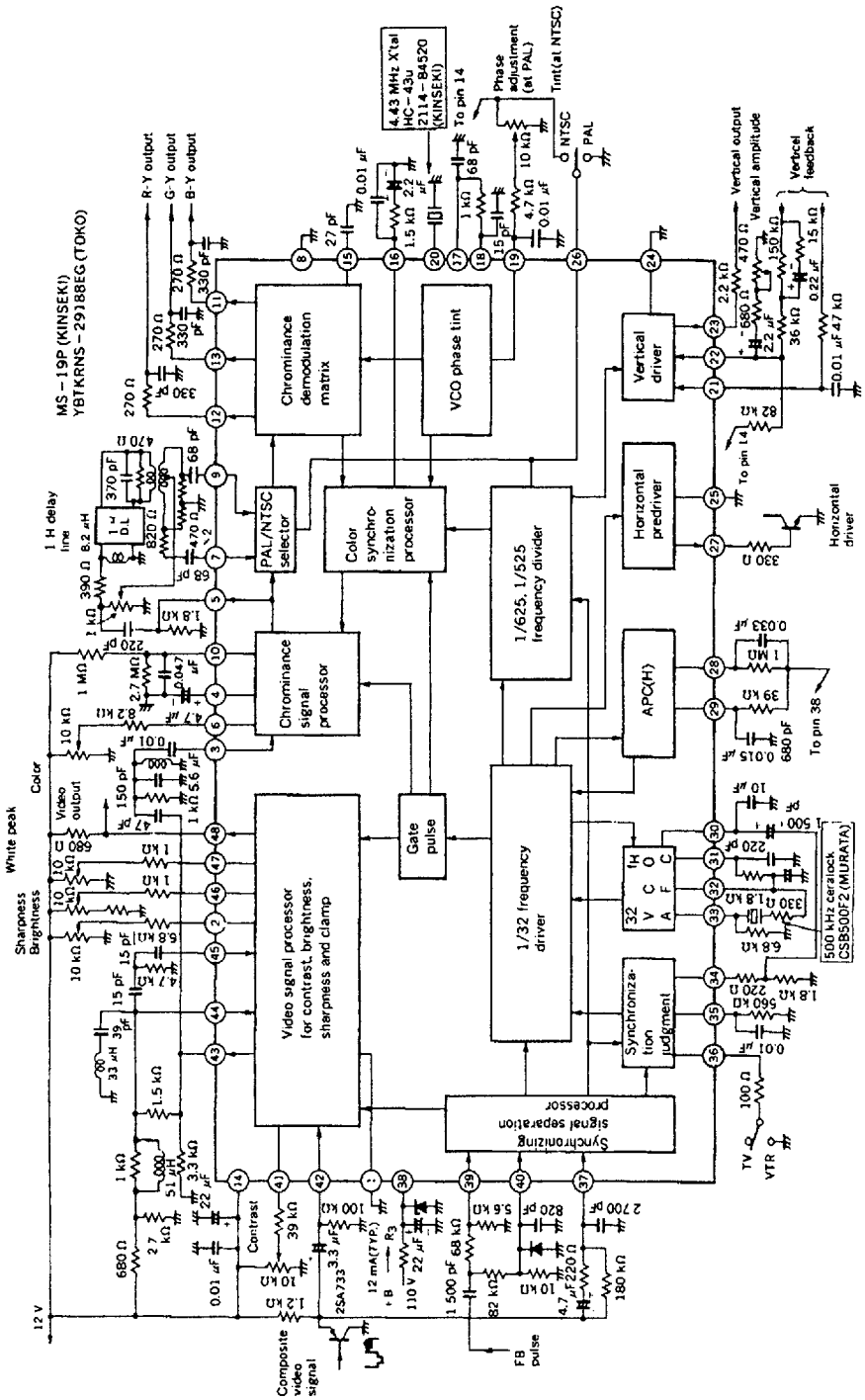
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Video Amplifier Stage Voltage Gain	A_{V2}	10.5	12	13.5	dB	Ratio of pin 48 output level to 0.6 V_{p-p} pin 44 input level including the sine wave 200 kHz synchronizing signal of video input (pin 42)
Brightness Control Characteristic 1	BR_1	8.2	8.5	8.8	V	Only the video input (pin 42) synchronizing signal is 0.3 V_{p-p}, BRT (pin 46) DC voltage when pin 48 is set to 7 V at black level.
Brightness Control Characteristic 2	BR_2	2.9	3.9		V	Only the video input (pin 42) synchronizing signal is 0.3 V_{p-p}. DC voltage of pin 48 at black level when BRT (pin 46) is set to 9.3 V.
Brightness Control Characteristic 3	BR_3		1.3	2.0	V	Only the video input (pin 42) synchronizing signal is 0.3 V_{p-p}. DC voltage of pin 48 at black level when BRT (pin 46) is set to 10 V.
Video Tone Control Characteristic 1	RE_1	−13.5	−11.5	−9.5	dB	2 MHz attenuation ratio to 0.6 V_{p-p} video output (pin 48) of 200 kHz including the sine wave 200 kHz/2 MHz synchronizing signal of video input (pin 42), soft video tone.
Video Tone Control Characteristic 2	RE_2	−6.5	−4.0	−1.5	dB	Identical to RE_1, sharp video tone.
White Peak Suppression Output Voltage	WS	3.8	4.4	5.0	V	Video input (pin 42) stair step 1 V_{p-p}, Output level at which the video output (pin 48) is clipped when BRT is increased at white peak set voltage 4.5 V.
Video Output Supply Voltage Variation	Δe_{oY} (V_{CC})			±5	%	Video input (pin 42) stair step 1 V_{p-p}, Video output level variation at V_{CC} = 12 ±1 V from the video output at V_{CC} = 12 V.
Video Output Ambient Temperature Variation	Δe_{oY} (T)			±10	%	Video input (pin 42) stair step 1 V_{p-p}, Video output level variation at T_a = 25 +35 °C from the video output at T_a = 25 °C.
Video Output DC Voltage Temperature Coefficient	$\Delta E_{oY}/\Delta T$	0	2.5	5.0	mV/°C	Only the video input (pin 42) synchronizing signal is 0.3 V_{p-p}. This is calculated from the DC level variation in the video output scanning period from the DC level at T_a = −10 to +60 °C.
Synchronizing Signal Separation Input DC Level	E_{IN} (SYNC)	7.3	7.6	7.9	V	No signal at synchronizing signal input (pin 37), DC voltage at pin 37.
Vertical Midpoint Output Control Threshold	V_{MIDP}	3.7	4.0	4.3	V	No signal at synchronizing input signal (pin 37), DC voltage of V_B to be canceled by the output pulse of vertical feedback input (pin 22).
Vertical Blanking Pulse Width	PW_{VBLK} P	(From V_{SYNC} + 0.5 H) 21.5 H ..... Odd 22 H ..... Even				Only the video input (pin 42) synchronizing signal is 0.3 V_{p-p}. The blanking pulse width of video output (pin 48) is measured.
	PW_{VBLK} N	(From V_{SYNC} + 0.5 H) 18 H ..... Odd 18.5 H ..... Even				
Vertical Output Pulse Width	PW_{VOUT} P	(From V_{SYNC} + 0.5 H) 21.5 H ..... Odd 22 H ..... Even				Only the video input (pin 42) synchronizing signal is 0.3 V_{p-p}. The vertical output pulse width of vertical feedback input (pin 21) is measured.
	PW_{VOUT} N	(From V_{SYNC} + 0.5 H) 18 H ..... Odd 18.5 H ..... Even				
Vertical Drive Stage Voltage Gain	A_{fVP}	4.8	6.3	7.8	V/V	No signal at video input (pin 42), Vertical output voltage (pin 23) between V_B 3.5 and 3.7 V (0.2 V).
Vertical Frequency Dividing Operation Start Voltage	V_{14P} (f_V-ON)		3.4	4.0	V	Only the video input (pin 42) synchronizing signal is 0.3 V_{p-p}. Supply voltage causing vertical output to be generated at vertical feedback input (pin 21).

CHARACTERISTIC		SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Vertical Tracing Start Voltage		V_{14P} (f_V)		3.5	5.0	V	Only the video input (pin 42) synchronizing signal is 0.3 $V_{p\text{-}p}$. Supply voltage causing the vertical output synchronizing signal of vertical feedback input (pin 21) to synchronize with SG1.
Horizontal Free-run Frequency		f_{HOP}	−50	0	+50	Hz	No signal at video input (pin 42), Frequency difference of the horizontal predriver output (pin 27) from f = 15.625 kHz.
f_{HO} Supply Voltage Variation	(1)	Δf_{HCP} (V_{CC1})		±15	±30	Hz	No signal at video input (pin 42), Frequency difference of V_{CC} = 12 ±1 V from f_{HOP} at V_{CC} = 12 V of horizontal predriver output (pin 27).
	(2)	Δf_{HOP} (V_{CC2})		−30	−100	Hz	Same as above, but frequency difference of V_{CC} − 7 V.
f_{HOP} Ambient Temperature Variation		Δf_{HOP} (T)			±20	Hz	T_a = 25 ±35 °C, no signal at video input (pin 42), Frequency variation for T_a = 25 ±35 °C compared with the frequency of the horizontal predriver output (pin 27) at T_a = 25 °C.
Horizontal Driver Output Pulse Width		P_{WHO}	21	23	25	μs	Only the video input (pin 43) synchronizing signal is 0.3 $V_{p\text{-}p}$. Horizontal pulse width of the horizontal predriver output (pin 27) (HIGH level period).
Horizontal Synchronizing Signal Range		f_{HPP}	±400	±650		Hz	Only the synchronizing signals that can vary the horizontal synchronizing frequency of video input (pin 42) are 0.3 $V_{p\text{-}p}$. Frequency range that allows synchronizing pulse width of 4.8 μs.
Horizontal Pulse Output Start Voltage		V_{38P} (f_H-ON)		3.5	5.0	V	Only the video input (pin 42) synchronizing signal is 0.3 $V_{p\text{-}p}$. Supply voltage which causes horizontal pulse to be generated from Horizontal pre-output (pin 27).
Horizontal Free-run Frequency Drift with Time		Δf_{HP} (DRIFT)		0	±15	Hz	No signal at video input (pin 42), Variation of the frequency from f_H measured five seconds after power-on 30 minutes after power-on.
Horizontal Killer Level		H_{KP}	−19	−15	−11	dB	Only the video input (pin 42) synchronizing signal is 0 dB = 0.25 $V_{p\text{-}p}$. Synchronizing signal attenuation level causing the H killer (pin 34) voltage of 1 V or more to be generated.
H_{KP} Supply Voltage Variation		ΔH_{KP} (V_{CC})			±4	dB	V_{CC} = 12 ±1 V, Identical to H_{KP}, Variation of V_o = 12 ±1 V from H_{KP} at V_{CC} = 12 V.
Demodulation System Selector Threshold Voltage		$V_{thP/N}$	0.7	1.1	1.5	V_{DC}	NTSC at $V_{36} > V_{thP/N}$, PAL at $V_{36} < V_{thP/N}$.
TV/VTR Selector Threshold Voltage		V_{th36}	0.6	0.9	1.2	V_{DC}	TV at $V_{35} > V_{th35}$ and open VTR at $V_{35} < V_{th35}$.
Vertical Free-run Frequency 1		f_{V1P}		f_H/352		V_{DC}	No signal at synchronizing input (pin 37), vertical feedback input (pin 21), horizontal predrivor output (pin 27), each frequency ratio SYNC SEP → V_{CC}. TV mode.
		f_{V1N}		f_H/296			
Vertical Free-run Frequency 2		f_{V2P}		f_H/288		V_{DC}	Identical to f_{V1}, but SYNC SEP → GND
		f_{V2H}		f_H/240			

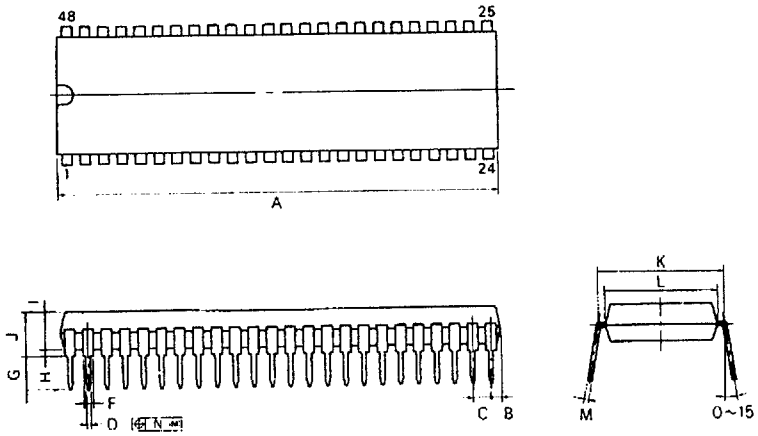
μPC1423CA MEASUREMENT CIRCUIT



μPC1423CA SAMPLE APPLICATION CIRCUIT



48PIN PLASTIC SHRINK DIP (600 mil)



P48C-70-600B

NOTES

1) Each lead centerline is located within 0.17 mm (0.007 inch) of its true position (T.P.) at maximum material condition.

2) Item "K" to center of leads when formed parallel.

ITEM	MILLIMETERS	INCHES
A	44.46 MAX.	1.751 MAX.
B	1.78 MAX.	0.070 MAX.
C	1.778 (T.P.)	0.070 (T.P.)
D	$0.50^{\pm 0.10}$	$0.020^{+0.004}_{-0.005}$
F	0.85 MIN.	0.033 MIN.
G	$3.2^{\pm 0.3}$	$0.126^{\pm 0.012}$
H	0.51 MIN.	0.020 MIN.
I	4.31 MAX.	0.170 MAX.
J	5.72 MAX.	0.226 MAX.
K	15.24 (T.P.)	0.600 (T.P.)
L	13.2	0.520
M	$0.25^{+0.10}_{-0.05}$	$0.010^{+0.004}_{-0.003}$
N	0.17	0.007