

BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC1423

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

The μ PC1423 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 μ PC1423 is contained in a 48 pin shrink DIP package suited to high-density mounting.

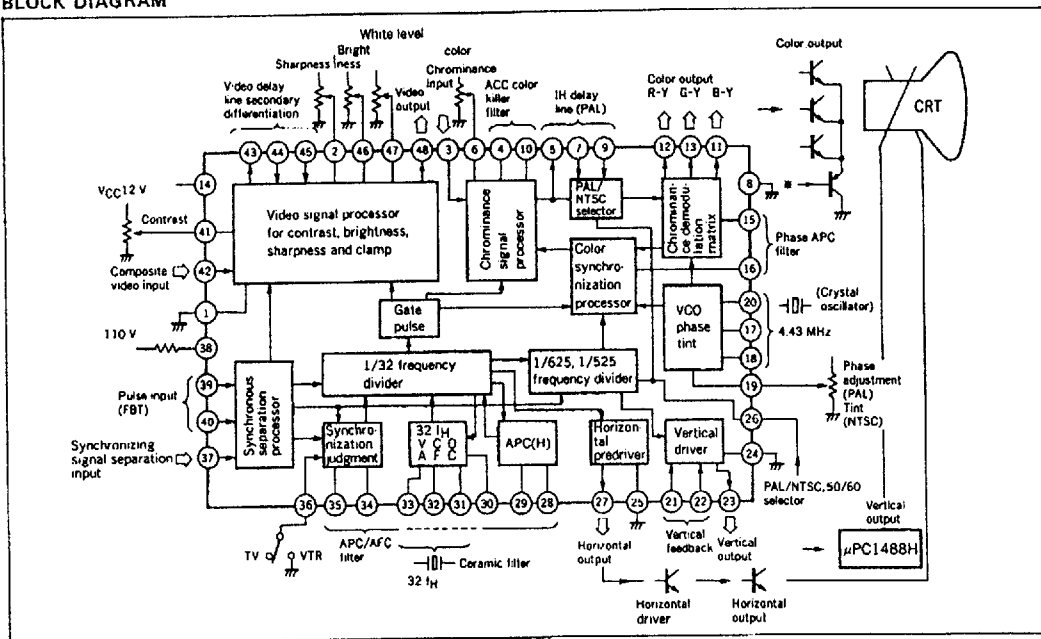
FEATURES

- 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

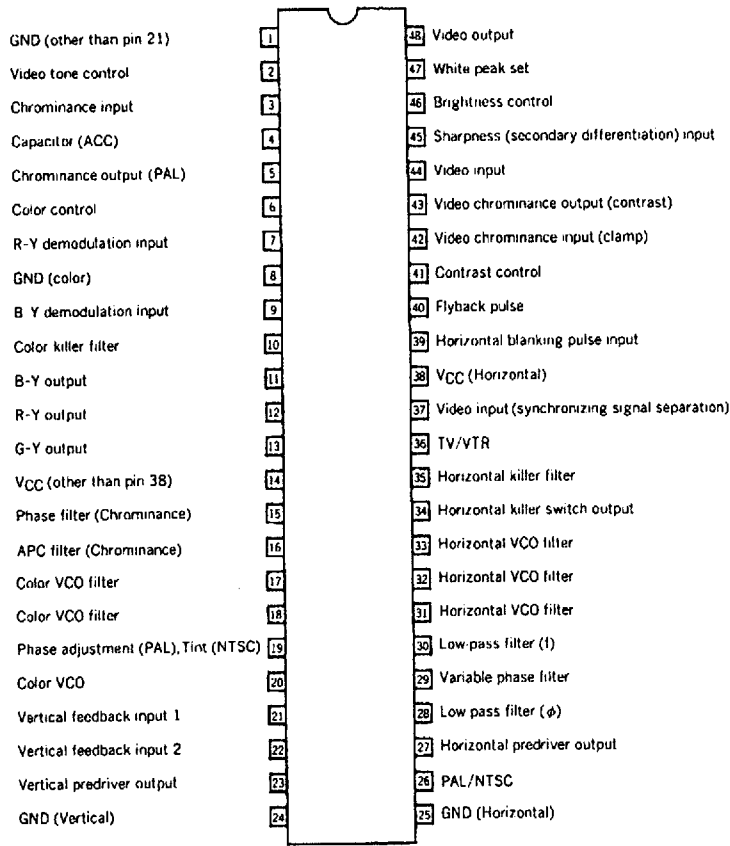
ORDER INFORMATION

Part Number	Package
μ PC1423CA(1)	48PIN PLASTIC SHRINK DIP (600 mil)

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 _i 42,44	5	V _{p-p}
Input Signal Voltage (Chrominance)	e _i 3,7,9	5	V _{p-p}
Input Signal Voltage (Deflection)	e _i 37	5	V _{p-p}
Input Signal Voltage (Sharpness)	e _i 45	8	V _{p-p}
Pulse Input Voltage	e _p 39,40	V ₁₄	V _p
Feedback Input Voltage	e _i 21,22	e _i 21: 7 V _p e _i 22: V ₁₄	V _p
Control Signal Voltage	e _c 2,6,19,26,44,46,47	V ₁₄	V
Output Current (Video)	I _o 48	-50 (V ₄₈ < 5 V)	mA
Output Current (Color Differential)	I _o 11,12,13	+10	mA
Output Current (Horizontal)	I _o 27	-10	mA
Output Current (Vertical)	I _o 23	+10	mA
Output Current (Video, Chrominance)	I _o 5	+10	mA
Output Current (Video, Chroma)	I _o 43	+10	mA
Package Allowable Loss	P _D	1.5 (T _a = 60 °C)	W
Operating Temperature	T _{opt}	-10 to +80	°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 _i 37,42	1	V _{p-p}
Chrominance Input Signal (Burst Signal)	e _i 3	200	mV _{p-p}
Blanking/Flyback Pulse Input Voltage	e _p 39,40	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 _o 27	-2 to +1	mA
Video Output Voltage (Black Level)	E _{OY}	6	V _{DC}

ELECTRICAL CHARACTERISTICS ($T_a = 25 \pm 3^\circ\text{C}$, $V_{CC} = 12\text{ V}$)

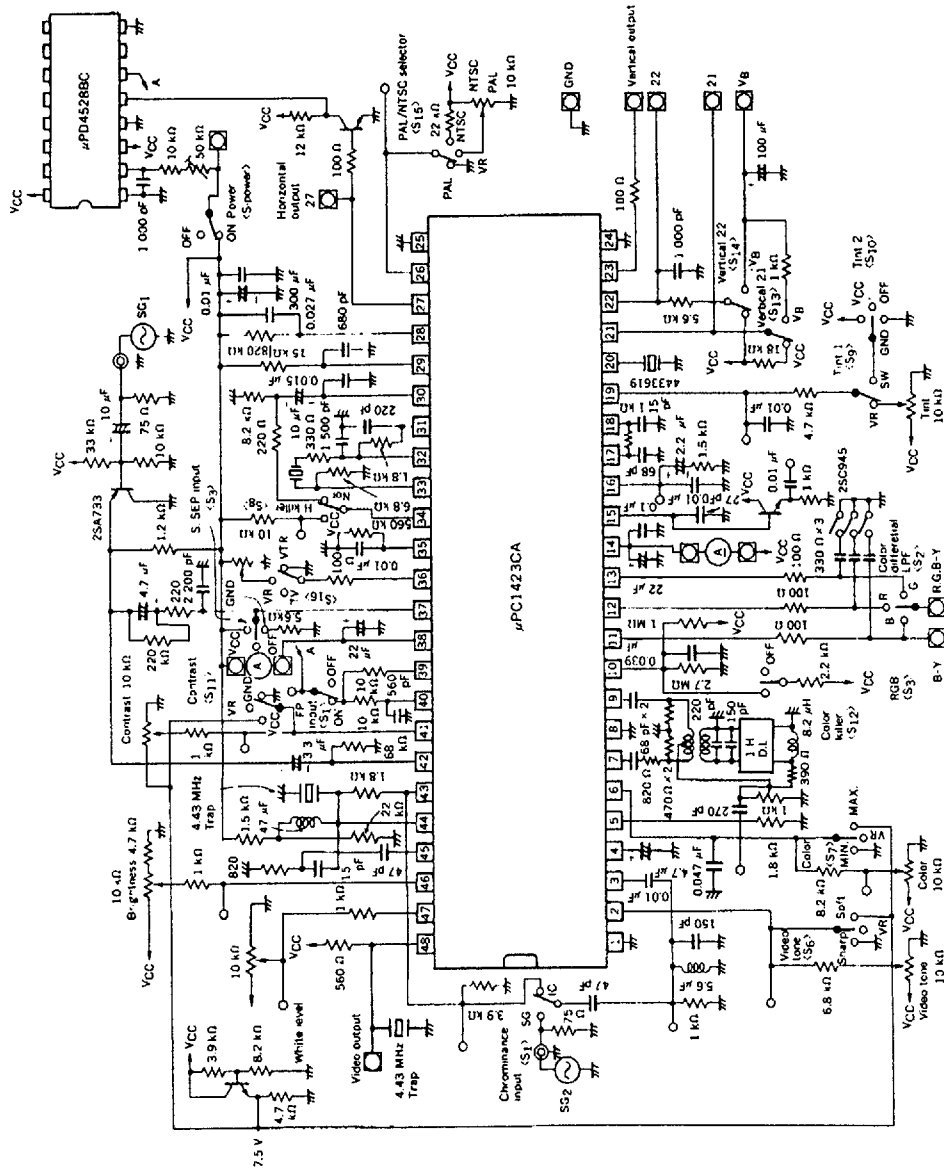
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Circuit Current	I_{CC14P}	45	60	85	mA	$V_{CC} = 12\text{ V}$, Pin 14
Circuit Current	I_{CC38}	8	12	16	mA	$V_{CC} = 12\text{ V}$, Pin 38
ACC Amplitude Characteristic 1	ACC ₁	-3	0	+3	dB	Chrominance input (pin 3) burst signal, 0 dB (200 mV _{p-p}) 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	$V_{CC} = 12 \pm 1\text{ V}$, identical to e_{KN} , Variation level from e_{KN} ($V_{CC} = 12\text{ V}$).
e_{KP} Ambient Temperature Variation	e_{KP} (T)			±4	dB	$T_a = 25 \pm 35^\circ\text{C}$, identical to e_{KP} , Variation level from e_{KP} ($T_a = 25^\circ\text{C}$).
Chrominance Output DC Voltage	$E_5(\text{OFF})$	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 $V_G = 4.3\text{ V}$.
B-Y Demodulation Output Supply Voltage Variation	e_{oBP} (V_{CC})			±25	%	$V_{CC} = 12 \pm 1\text{ V}$ burst signal 200 mV _{p-p} , Level variation from B-Y output 2.9 V _{p-p} at $V_{CC} = 12\text{ V}$.
B-Y Demodulation Output Ambient Temperature Variation	e_{oBP} (T)			±15	%	$T_a = 25 \pm 35^\circ\text{C}$, identical to e_{o3P} , Level variation from B-Y output 2.9 V _{p-p} at $T_a = 25^\circ\text{C}$.
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 $V_{16} = 2\text{ V}$.
	f_{sc2P}	-0.7	-1.1	-1.6	kHz	No signal (pin 42), Difference between the VCO frequency and 4 433.619 kHz at $V_{16} = 10\text{ V}$.
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	∠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	∠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.
EO(R-Y) Line Variation	E _{OR-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	ΔE _{(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	ΔE _{(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	AV ₁	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 43) 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	0.5 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

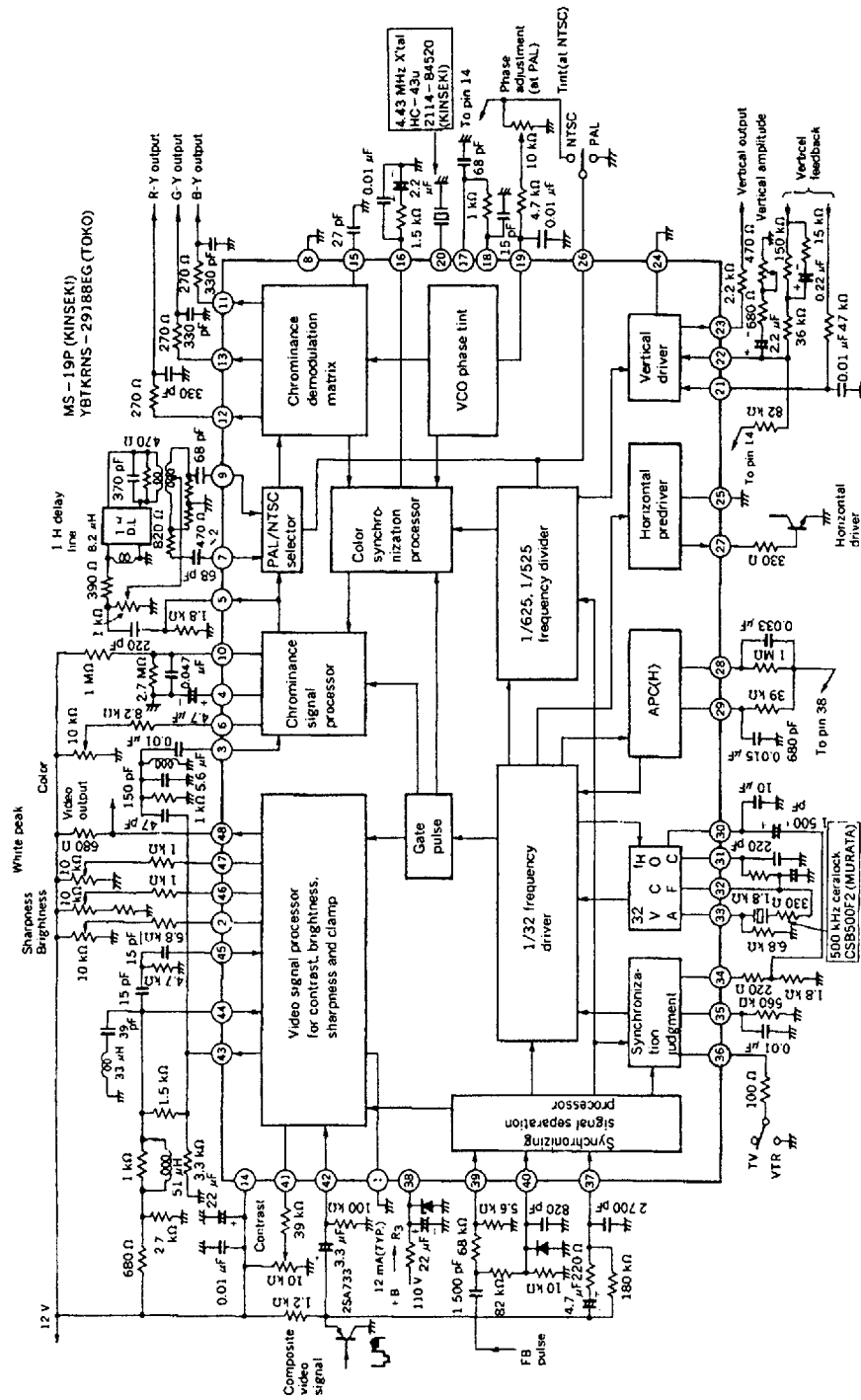
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITION
Video Amplifier Stage Voltage Gain	A_{V2}	10.5	12	13.5	dB	Ratio of pin 48 output level to 0.6 V_{p-p} pin 44 input level including the sine wave 200 kHz synchronizing signal of video input (pin 42)
Brightness Control Characteristic 1	BR_1	8.2	8.5	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	$\Delta e_o Y$ (V_{CC})			± 5	%	Video input (pin 42) stair step 1 V_{p-p} . Video output level variation at $V_{CC} = 12 \pm 1$ V from the video output at $V_{CC} = 12$ V.
Video Output Ambient Temperature Variation	$\Delta e_o Y$ (T)			± 10	%	Video input (pin 42) stair step 1 V_{p-p} . Video output level variation at $T_a = 25 \pm 35^\circ C$ from the video output at $T_a = 25^\circ C$.
Video Output DC Voltage Temperature Coefficient	$\Delta E_o Y / \Delta T$	0	2.5	5.0	mV/ $^\circ C$	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 $+60^\circ C$.
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			V	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			V	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_{VP}	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-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 $V_{CC} = 12 \pm 1$ 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	$T_a = 25 \pm 35^\circ\text{C}$, no signal at video input (pin 42), Frequency variation for $T_a = 25 \pm 35^\circ\text{C}$ compared with the frequency of the horizontal predriver output (pin 27) at $T_a = 25^\circ\text{C}$.
Horizontal Driver Output Pulse Width		P_{WHO}	21	23	25	μs	Only the video input (pin 43) synchronizing signal is 0.3 V_{p-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-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-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-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	$V_{CC} = 12 \pm 1$ V, Identical to H_{KP} . Variation of $V_o = 12 \pm 1$ 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 predriver output (pin 27), each frequency ratio SYNC SEP \rightarrow 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 \rightarrow GND
	f_{V2H}			$f_H/240$			

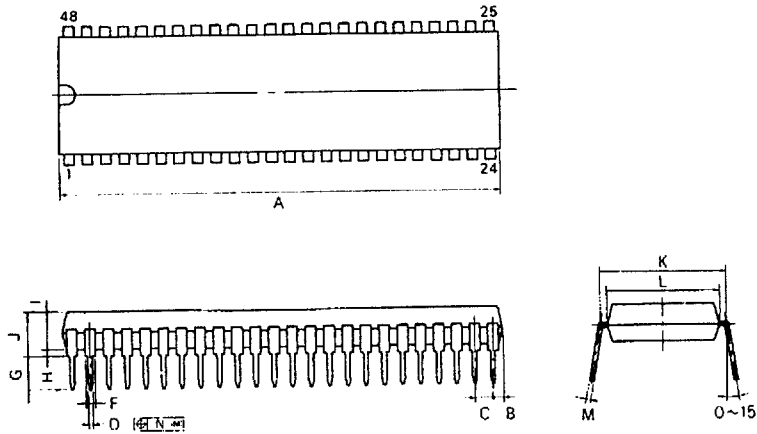
μPC1423CA MEASUREMENT CIRCUIT



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 ± 0.10	0.020 ± 0.004
F	0.85 MIN.	0.033 MIN.
G	3.2 ± 0.3	0.126 ± 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 ± 0.05	0.010 ± 0.002
N	0.17	0.007