

BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC1365C

PAL CHROMINANCE AND LUMINANCE PROCESSOR

SILICON BIPOLAR MONOLITHIC INTEGRATED CIRCUIT

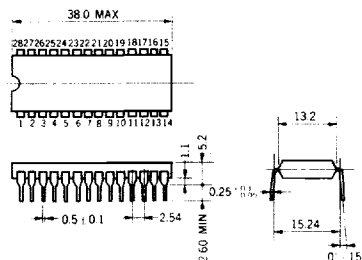
DESCRIPTION

μ PC1365C is a luminance and chrominance stage LSI for PAL system TV sets. It contains luminance amplifier, chroma IF amplifier, sub-carrier oscillator, PAL switching circuit, chroma demodulator, matrix circuit, and the other necessary additions. It puts out R,G,B primary colors. This LSI restores 100 % of the DC level. And it is easy to adapt remote control system to "BRIGHTNESS", "CONTRAST", and "COLOR SATURATION", as the control terminals are designed to high impedance.

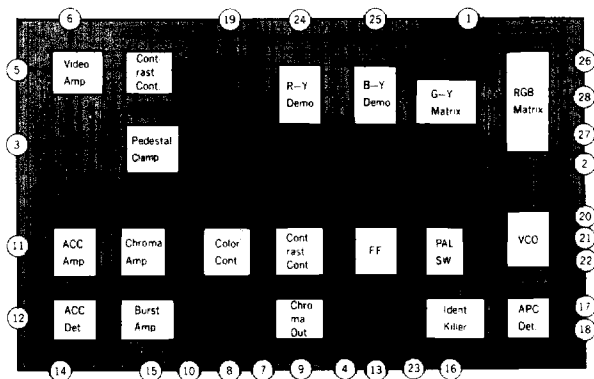
FEATURES

- This LSI has built-in function for PAL-SECAM dual system.
 - 1) Two ICs construction by NEC's SECAM IC μ PC1364C2.
 - 2) Only one 1-H delay line is required for dual system.
 - 3) Automatically switchable function for PAL/SECAM signals.
- This LSI can process both of the chrominance and the luminance signals.
- Due to DC control method for color, contrast, and brightness control, the wiring is rather easy and the expansion to remote control receiver are also rather easy.
- The level of color killer circuit can be adjusted from the outside and the color killer circuit has proper hysteresis characteristics.
- The input circuit require only the band pass filter and 4.43 MHz trap. Furthermore, the demodulated output are R,G,B signals. So that the chroma output stage are quite simplified.
- The contrast control can automatically adjust the levels of chroma and contrast luminance signal under the relation that the normal picture is always kept.
- The output terminals of demodulated chroma signals and all input circuits are protected by the surge protection diode.

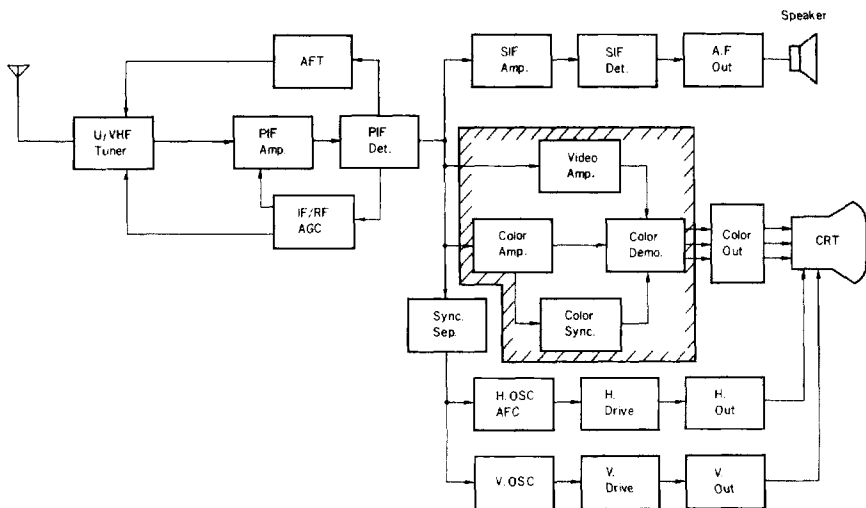
PACKAGE DIMENSIONS in millimeters



IC BLOCK DIAGRAM



TV BLOCK DIAGRAM



PIN CONNECTION (Top View)

Power Supply	1	28	G Output
Blanking Input	2	27	B Output
Capacitor (Pedestal Clamp)	3	26	R Output
Brightness Control	4	25	B-Y Demo Input
Luminance Input	5	24	R-Y Demo Input
Capacitor (Emitter Peaking)	6	23	Line Pulse Input
Contrast Control	7	22	Oscillator Input
Color Control	8	21	Oscillator Input
Chroma Output	9	20	Oscillator Output
Capacitor (By-Pass)	10	19	Burst Gate Pulse Input
Chroma Input	11	18	A.P.C. Filter
A.C.C. Filter	12	17	A.P.C. Filter
Killer Filter	13	16	Burst Input (A.P.C. Ident Killer)
GND	14	15	Burst Output

μ PC1365C Standard Using Conditions

Supply Voltage	12	V
Chrominance Input Signal (Burst Signal Level)	100	mV _{p-p}
Luminance Input Signal	1	V _{p-p}
Gate Pulse Input Level	3	V _p
H. Pulse Input Level	3	V _p
Blanking Pulse Input Level	3	V _p
Demodulator Chrominance Input Signal	0.2	V _{p-p}
R,G,B Output Voltage (Black Level)	2.0	V
Color Saturation Controlling Voltage	0 to 12	V
Contrast Controlling Voltage	0 to 12	V
Brightness Controlling Voltage	0 to 12	V

ABSOLUTE MAXIMUM RATINGS (T_a = +25 °C Unless otherwise)

Supply Voltage	V _{CC}	15	V
Power Dissipation	P _d (T _a = +70 °C)	750	mW
Signal Input Voltage	e _i	5	V _{p-p}
Pulse Input Voltage	e _p	± 6	V
Operating Temperature	T _{opt}	-20 to + 70	°C
Storage Temperature	T _{stg}	-40 to + 125	°C

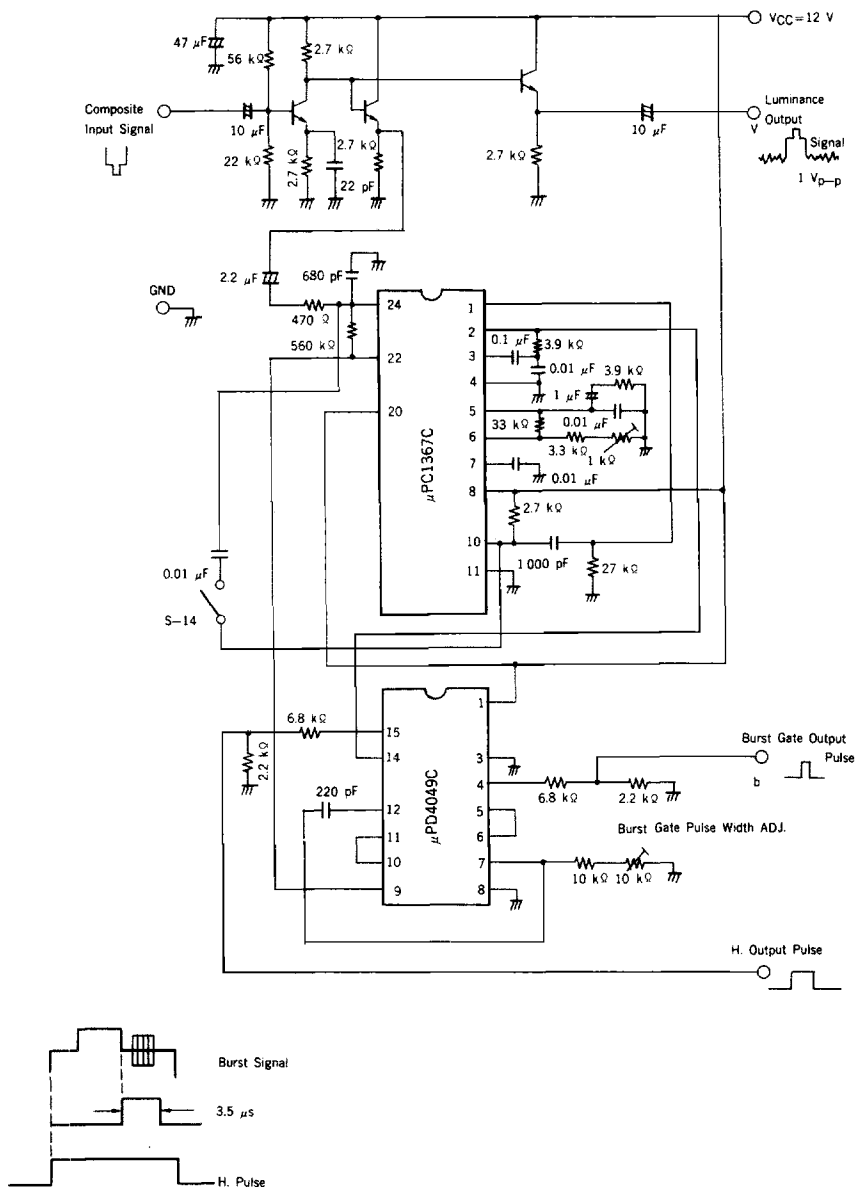
ELECTRICAL CHARACTERISTICS (Ta = 25 °C unless otherwise noted, VCC = 12 V)

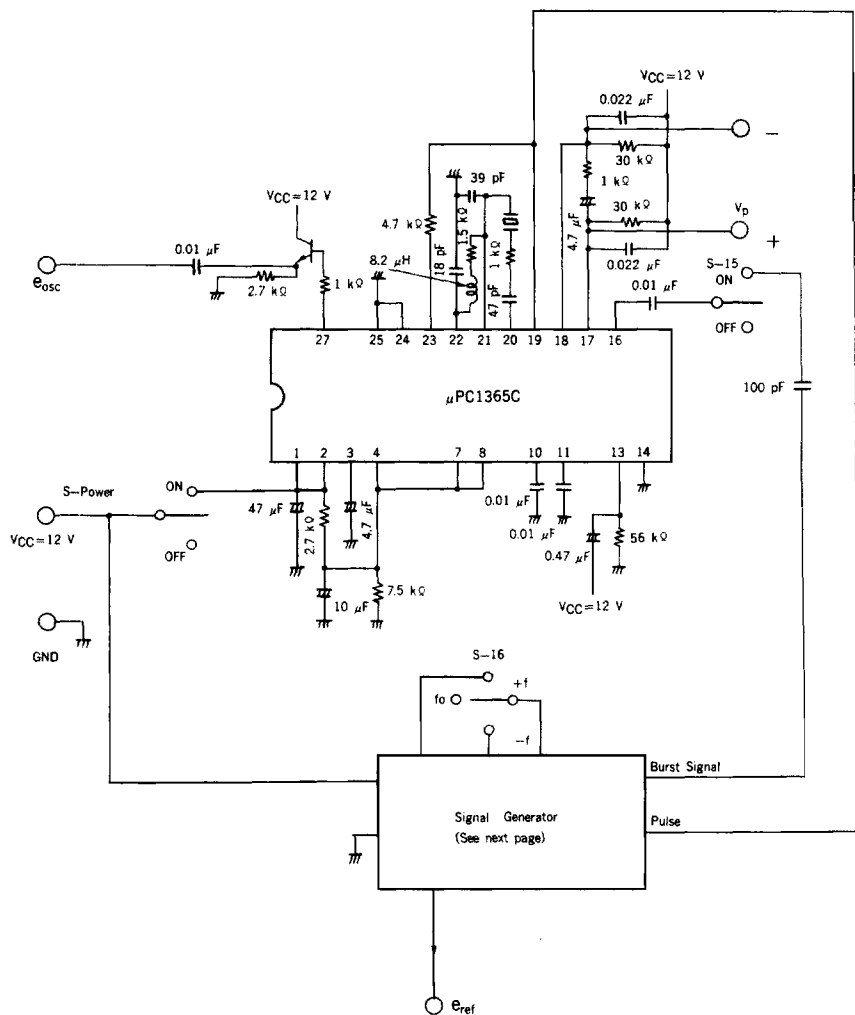
NO	CHARACTERISTIC	SYMBOL	TEST CKT	MIN.	TYP.	MAX	UNIT	TEST CONDITION
1	Burst Output Voltage	e_b	1	0.9	1.2	1.6	V _{p-p}	Input 100 mV _{p-p} Rainbow color bar signal
2	ACC Range	ACC	1	0.6	0.8	1.0	times	Input 10 mV _{p-p} Burst Output/ e_b
3	Chroma Output Voltage 1	e_{c1}	1	0.5	0.7	1.0	V _{p-p}	Input 100 mV _{p-p} Rainbow color bar signal Saturation control MAX
4	Chroma Output Voltage 2	e_{c2}	1		0.2		V _{p-p}	Input 100 mV _{p-p} Rainbow color bar signal Saturation control MID
5	Chroma Output Voltage 3	e_{c3}	1			6	mV _{p-p}	Input 100 mV _{p-p} Rainbow color bar signal Saturation control MIN
6	Killer Sensitivity	e_k	1	-34	-40	-46	dB	0 dB = Input 100 mV _{p-p} Rainbow color bar signal Killer ON Input level
7	Killer Hysteresis	e_{kh}	1	—	1	2	dB	Killer ON-OFF Input level
8	Oscillator Controlling Sensitivity	β	2	1.3	1.8	2.3	Hz/mV	Measure Vp Voltage at Burst frequency fo ± 100 Hz
9	Phase Detector Sensitivity	μ	2	20	40	60	mV/degree	Measure Vp Voltage at Burst frequency fo ± 100 Hz
10	Phase error	$\Delta\phi$	2	—	1.5	3.0	degree/100 Hz	Burst frequency fo ± 100 Hz
11	APC Pull-in frequency Range	f_p	2	±300	±500	—	Hz	Changing frequency of Burst signal
12	APC Detector Output balance Voltage	V _p	2	-100	0	+100	mV	No Input signal at Pin 16
13	B-Y Output Voltage	e_{o1}	1	1.5	2.0	2.5	V _{p-p}	Input 0.2 V _{p-p} f = 4.44 MHz 10 kHz beat Output signal
14	Ratio of R-Y to B-Y	R/B	1	0.49	0.56	0.63	times	Input 0.2 V _{p-p} f = 4.44 MHz 10 kHz beat Output signals
15	Ratio of G-Y to B-Y	G/B	1	0.30	0.34	0.38	times	Input 0.2 V _{p-p} f = 4.44 MHz 10 kHz beat Output signals
16	Relative Output Phase B-Y to R-Y	$\angle R$	1	85	90	95	degree	Input 0.2 V _{p-p} f = 4.44 MHz
17	Relative Output Phase B-Y to G-Y	$\angle G$	1	228	236	244	degree	Input 0.2 V _{p-p} f = 4.44 MHz
18	Maximum Color Difference Output Voltage	e_{o2}	1	4.5	5.5	—	V _{p-p}	Input 1.2 V _{p-p} f = 4.44 MHz 10 kHz beat Output signal at B-Y Output Pin
19	Output Residual Carrier level	e_{car}	1	—	—	100	mV _{p-p}	No Input signal at Pin 24 and 25
20	Overall color Difference Output Voltage at B-Y signal	e_{o3}	1	1.0	1.7	2.5	V _{p-p}	Saturation control MID Input 100 mV _{p-p} Rainbow color bar signal Contrast control MAX
21	Overall color Difference Output Variable Range by Contrast	e_{oc}	1	15	17	19	dB	Input 100 mV _{p-p} Rainbow color bar signal Contrast control MAX/MIN
22	Luminance Gain	Av1	1	4.1	4.5	5.1	times	Input 1 V _{p-p} Color bar 100 % White signal Contrast control MAX

NO	CHARACTERISTIC	SYMBOL	TEST CKT	MIN.	TYP.	MAX	UNIT	TEST CONDITION
23	Relative Ratio of Luminance Gain	ΔA_v1	1	—	1.0	1.1	times	Input 1 V _{p-p} Color bar 100 % White signal Contrast control MAX
24	Luminance Gain Variable Range by Contrast	E_{vc}	1	15	17	19	dB	Input 1 V _{p-p} Color bar 100 % White signal Contrast control MAX/MIN
25	Differential Gain	D.G.	1	—	—	6	%	Input 1 V _{p-p} Stair step signal RGB Output, Black level = 2 V
26	DC Restoration	T_{DC}	1	90	95	100	%	Input 1 V _{p-p} Stair step signal APL = 10 to 90 %
27	Luminance Amp Frequency Characteristic	f_v	1	4.0	5.5	—	MHz	Input 0.1 V _{r.m.s.} Sine wave signal, -3 dB down Pin 6 open
28	Brightness Controlling Sensitivity	BR	1	3.8	4.3	4.8	—	Quiescent Output Voltage = 2 to 5V, (V26, V27, V28) Sensitivity 3 V/ $\Delta V4$
29	Maximum R,G,B Output Voltage	E_{OM}	1	7	—	—	V	Brightness Controlling Voltage = 12 V
30	Quiescent Output Voltage	E_o	1	2.5	3.3	4.1	V	No Luminance Input signal Brightness V4 = 9 V Contrast MAX VCO operating
31	Quiescent Output Voltage Temperature Coefficient	E_{O-T}	1	-2	0	+2	mV/°C	R,G,B Output $T_a = -20$ to $+70$ °C V26 = 3.5 V at $T_a = 25$ °C
32	Difference Output Voltage	$\begin{cases} E_{R-G} \\ E_{G-B} \\ E_{B-R} \\ E_{x-y} \end{cases}$	1	-300	0	+300	mV	V26 = 3.5 V VCO operating
33	Difference Output Voltage Temperature Coefficient	$\Delta E_{x-y}/\Delta T$	1	—	0	60	mV	26 = 3.5 V at $T_a = 25$ °C $T_a = -20$ to $+70$ °C
34	Supply Current	I_{CC}	3	32	43	54	mA	$V_{CC} = 12$ V
35	Changing Black level by Contrast	ΔE_{oc}	1	-100	0	+100	mV	No Luminance Input signal V26 = 2 V at Contrast MAX Contrast control MAX/MIN
36	Minimum Gate Pulse Input Voltage	V_G (min)		—	—	2	V	Pin 19
37	Blanking Pulse Input Voltage Range	V_B		1.8	—	5	V	Pin 2
38	Minimum FF Trigger Input Voltage	V_{FF} (min)		—	—	1.5	V	Pin 23

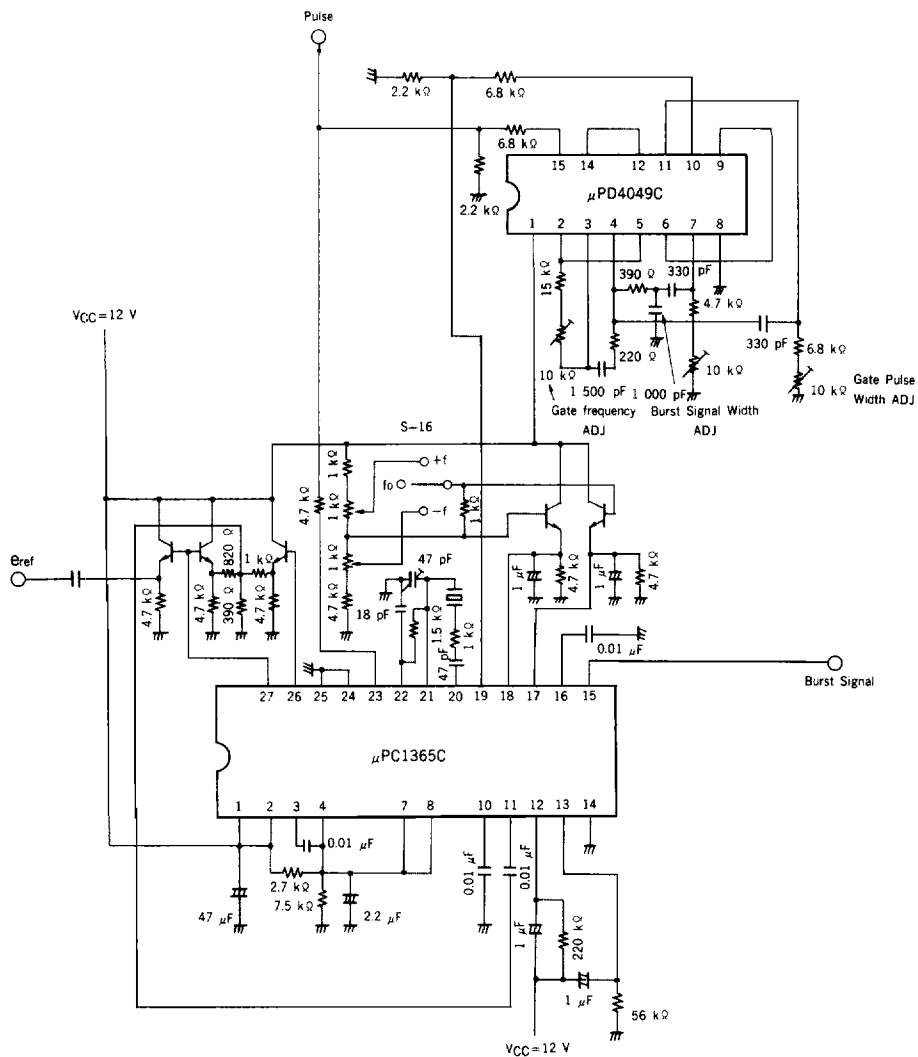


μPC1365C Signal Generator (TEST CIRCUIT 1)

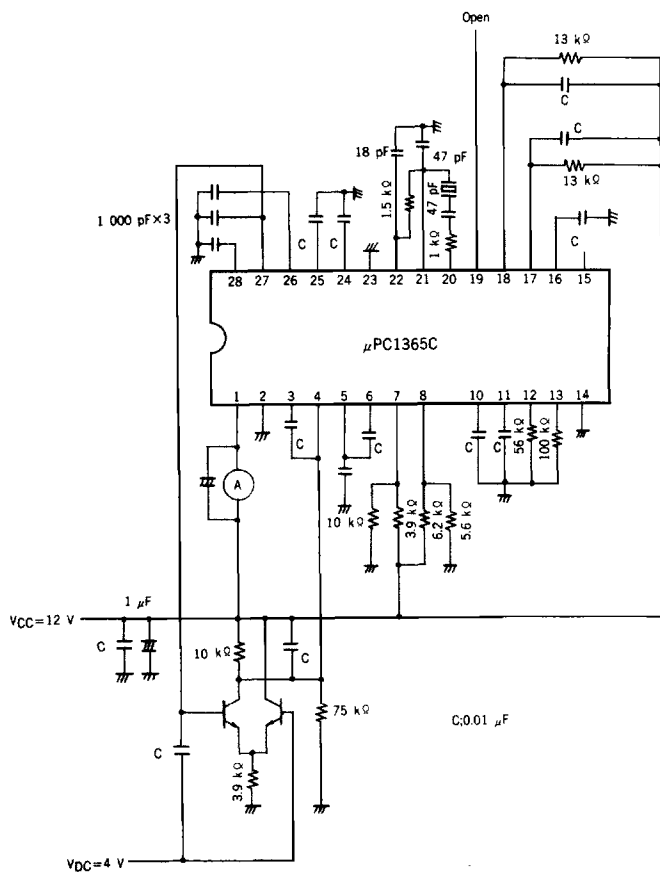


μ PC1365C TEST CIRCUIT 2

μ PC1365C Signal Generator (TEST CIRCUIT 2)



μPC1365C TEST Circuit 3



	e _b	ACC	e _{c1}	e _{c2}	e _{c3}	e _k , e _{kh}	e _{o1}	R/B	G/B	⊥ R
S-1 Input	ON	OFF	ON	ON	ON	OFF	ON	ON	ON	ON
S-2 Lum	INV	INV	INV	INV	INV	INV	INV	INV	INV	INV
S-3 Lum	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
S-4 Chro.	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF
S-5 Cont.	MAX	MAX	MAX	MAX	MAX	MAX	MAX	MAX	MAX	MAX
S-6 Satu.	MID	MID	MAX	MID	MIN	MID	MID	MID	MID	MID
S-7 VCO	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM	NORM
S-8 FF.	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF
S-9 Dem.	INT	INT	INT	INT	INT	INT	EXT	EXT	EXT	EXT
S-10 Syst.	PAL	PAL	PAL	PAL	PAL	PAL	PAL	PAL	PAL	PAL
S-11 Blk	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
S-12 Output	B	B	B	B	B	B	B	R	G	R
S-13 Output	e _{o3}	e _{o3}	e _{o3}	e _{o3}	e _{o3}	e _{o3}	e _{o3}	e _{o3}	e _{o3}	e _{o3}
S-14	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON

VR-1	Be trimmed V26 = 3.5 V by Brightness VR (VR-1)									
VR-2										
Input	A	A = SG B - C = ATT	A	A	A	A = SG B - C = ATT	D = SG	D = SG	D = SG	D = SG
SG	Rainbow						f = 4.44 MHz			
Measure Point	e _b	e _b	e _c	e _c	e _c	e _c	e _{oB}	e _{oB} , e _{o3}	e _{oB} , e _{o3}	e _{oB} , e _{o3}
	Oscilloscope									Phase Meter
		ATT				ATT			AC Volt meter	

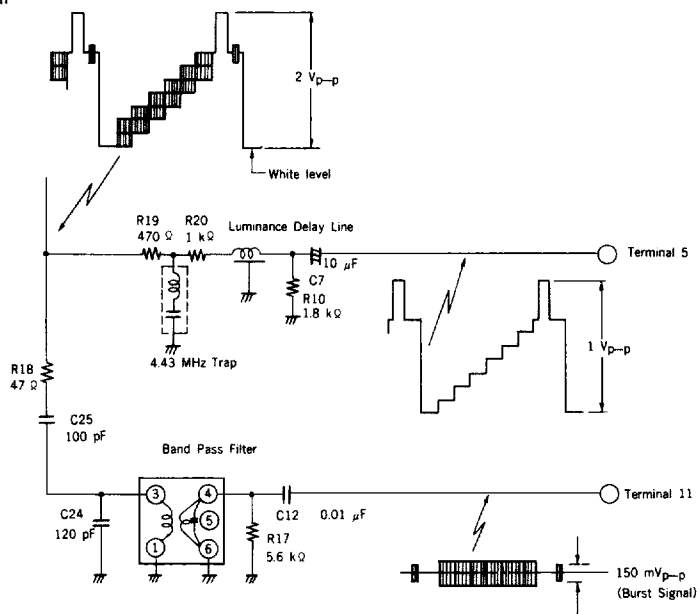
	L G	e _{o2}	e _{car}	e _{o3}	e _{oc}	Av1, ΔAv1	e _{vc}	DG	T _{DC}	f _v
S-1 Input	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
S-2 Lum.	INV	INV	INV	INV	INV	INV	INV	INV	INV	NORM
S-3 Lum.	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON
S-4 Chro.	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
S-5 Cont.	MAX	MAX	MAX	MAX	MAX, MIN	MAX	MAX, MIN	MAX	MAX	MAX
S-6 Satu.	MID	MID	MID	MID	MID	MID	MID	MID	MID	MID
S-7 VCO	NORM	NORM	NORM	NORM	NORM	STOP	STOP	STOP	STOP	STOP
S-8 FF.	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
S-9 Dem.	EXT	EXT	EXT	INT	INT	EXT	EXT	EXT	EXT	EXT
S-10 Syst.	PAL	PAL	PAL	PAL	PAL	PAL	PAL	PAL	PAL	PAL
S-11 Blk	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
S-12 Output	G	B	BRG	B	B	BRG	B	BRG	B	BRG
S-13 Output	e _{o3}	e _{o3}	e _{o3}	e _{o3}	e _{o3}	e _v	e _v	e _v	e _v	e _v
S-14	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	ON
VR-1	Be trimmed V26 = 3.5 V by Brightness VR (VR-1)					Be trimmed V26 = 2 V by Brightness VR (VR-1)				V26 = 3.5 V
VR-2										
Input	D = SG	D = SG	—	A	A	A	A	A	A	C = SG
SG	f = 4.44 MHz		—	Rainbow		Video SG 100 % White		Stair Step		SG = CW
Measure Point	e _{oB} , e _{o3}	e _{oB}	e _{car}	e _{o3}	e _{o3}	e _v	e _v	e _v	e _v	e _v
	Phase Meter	Oscilloscope						Vector scope	Oscilloscope	RF Volt meter

	BR	E _{0M}	E ₀ , E _{0-T}	$\frac{\Delta E_{x-y}}{\Delta T}$	ΔE_{oc}	V _G (min)	V _B	V _{FF}
S-1 Input	ON	ON	ON	ON	ON			
S-2 Lum.	INV	INV	INV	INV	INV			
S-3 Lum.	OFF	OFF	OFF	OFF	OFF			
S-4 Chro.	OFF	OFF	OFF	OFF	OFF			
S-5 Cont.	MAX	MAX	MAX	MAX	MAX, MIN			
S-6 Satu.	MID	MID	MID	MID	MID			
S-7 VCO	NORM	NORM	NORM	NORM	NORM			
S-8 FF.	OFF	OFF	OFF	OFF	OFF			
S-9 Dem.	EXT	EXT	EXT	EXT	EXT			
S-10 Syst.	PAL	PAL	PAL	PAL	PAL	PAL	PAL	PAL
S-11 Blk	OFF	OFF	OFF	OFF	OFF			
S-12 Output	BRG	BRG	BRG	RG	B			
S-13 Output	e ₀₃	e ₀₃	e ₀₃	e ₀₃	e ₀₃			
S-14	ON	ON	ON	ON	ON			
VR-1	See TEST Condition	TP = V _{CC}	TP = 9 V	V ₂₆ = 3.5 V	V ₂₆ = 2 V			
VR-2								
Input								
SG								
Measure Point	e ₀₃	e ₀₃	e ₀₃	e ₀₃ , e _{ov}	e ₀₃			
DC Voltmeter								

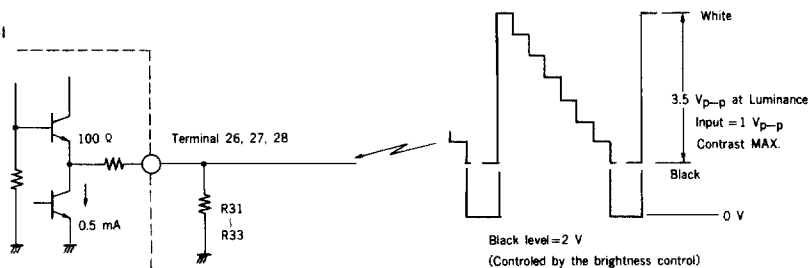
	β	μ	$\Delta\phi$	f_p	V_p
S-15 $f_o \pm f$	ON	ON	ON	OFF ON ON OFF	OFF
S-16 Burst	+f (100 Hz) -f (100 Hz)			+f (300 Hz) -f (300 Hz)	f_o
Measure Point	V_p e_{ref}	V_p e_{ref}, e_{osc}	e_{ref}, e_{osc}	e_{ref}	V_p
	f.Counter DC Voltmeter	Phase Meter f.Counter DC Voltmeter	Phase Meter f.Counter	f.Counter	DC Voltmeter

μ PC1365C Input and Output signals

Luminance Input Signal



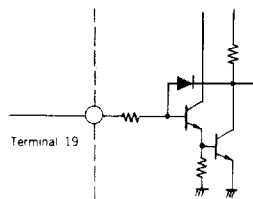
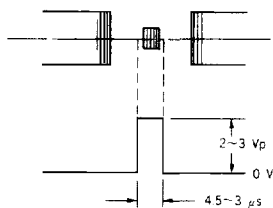
Output Signal



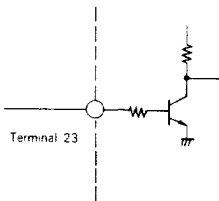
μPC1365C Input Pulse

Burst Gate Pulse

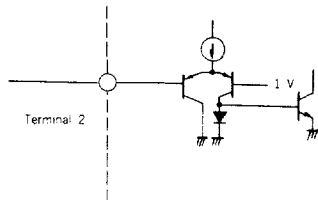
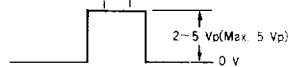
Burst signal = 100 ~ 200 mVp-p
at Terminal 11



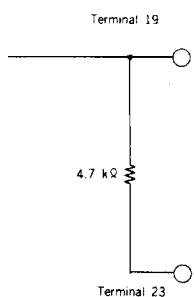
Line Pulse



**Blanking Pulse
(Line Pulse and
Field Pulse)**



**In case of commonly
using of Input Pulse**



μ PC1365C

*Color, Contrast and Brightness controlling circuit

- VR1 ; Brightness Control
 VR102 ; Sub Brightness
 VR2 ; Contrast Control
 VR103 ; Sub Contrast
 VR3 ; Color Control
 VR104 ; Sub Color

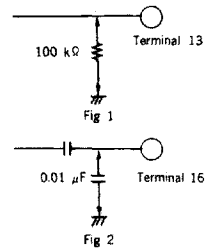
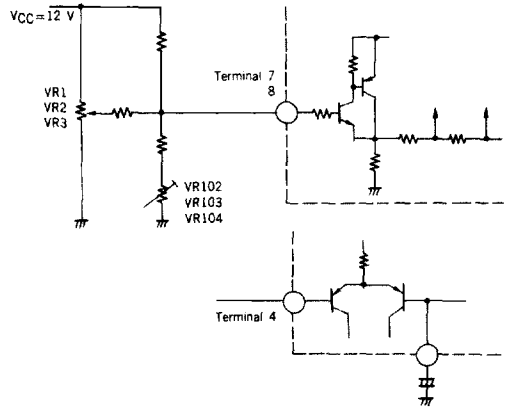
- V7 (Contrast) 5.5 to 7.0 to 8.5 V
 V8 (Color) 4.0 to 5.5 to 7.0 V
 V2 (Brightness) 8.2 to 8.7 to 9.2 V

*Color Killer Setting VR105

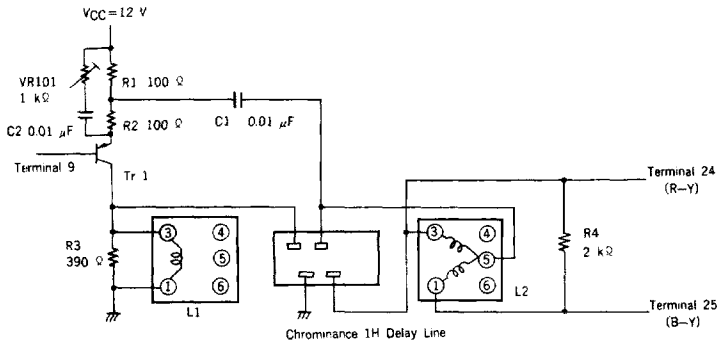
*APC Setting

Method; 1; Be connected Resistor (100 k Ω) between the Terminal 13 and GND as shown Fig. 1 (Killer OFF)

- 2; Be connected Capacitor (0.01 μ F) between the Terminal 16 and GND as shown Fig. 2 (Burst Input OFF)
 3; Be trimmed 4.433 618 MHz by using VR107

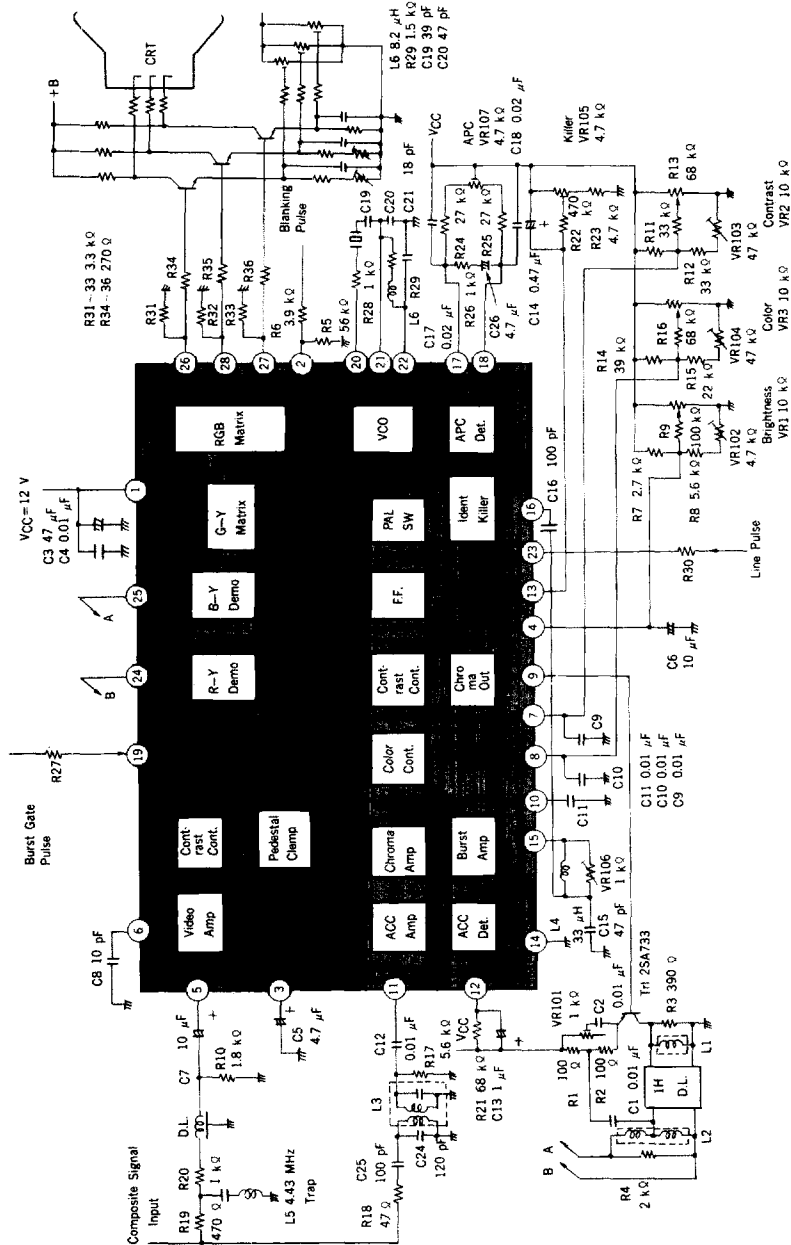


*1H Delay Line Circuit

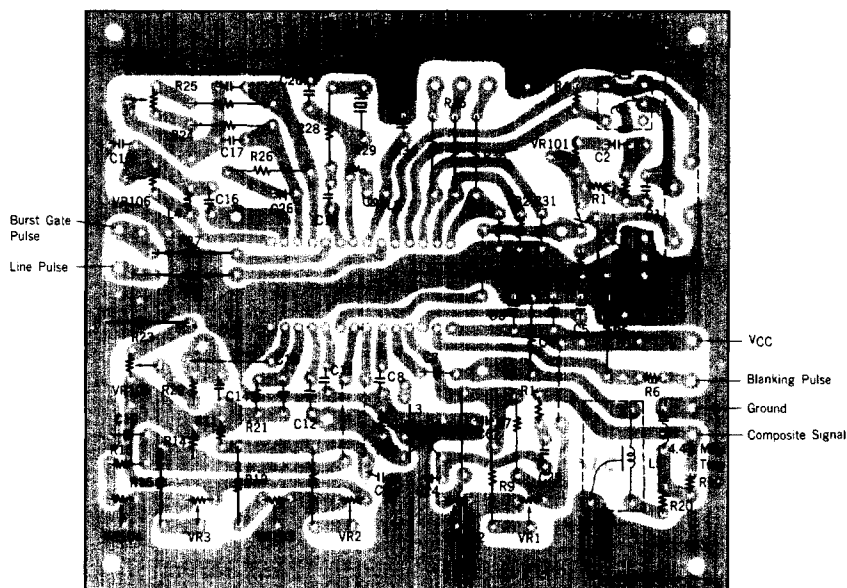


- L1 ; Pre Chrominance Delay Line Terminating Coil
 L2, VR101 ; Delay Phase and Amplitude Adjustment
 VR106 ; Sub carrier Phase Adjustment

The Block Diagram and External Components for μPC1365C



Printed Circuit Board Pattern (Bottom View)

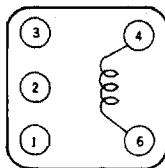


μPC1365C Table of the external components

Symbol	Value	Symbol	Value	Symbol	Value
R1	100 Ω	C1	0.01 μF	VR-1	10 kΩ Brightness
R2	100 Ω	C2	0.01 μF	VR-2	10 kΩ Contrast
R3	390 Ω	C3	47 μF	VR-3	10 kΩ Color Saturation
R4	2 kΩ	C4	0.01 μF	VR101	1 kΩ D.L. Level
R5	(56 kΩ)	C5	4.7 μF	VR102	4.7 kΩ Sub Brightness
R6	(39 kΩ)	C6	10 μF	VR103	47 kΩ Sub Contrast
R7	2.7 kΩ	C7	10 μF	VR104	47 kΩ Sub Color Saturation
R8	5.6 kΩ	C8	10 pF	VR105	4.7 kΩ Killer Adj
R9	68 kΩ	C9	0.01 μF	VR106	1 kΩ Phase Adj
R10	1.8 kΩ	C10	0.01 μF	VR107	4.7 kΩ APC Adj
R11	33 kΩ	C11	0.01 μF	L1	D.L. Matching Coil Type No TKRNS 24984NK (Toko Corp.)
R12	33 kΩ	C12	0.01 μF	L2	D.L. Matching Coil Type No TKRNS 24985VN (Toko Corp.)
R13	68 kΩ	C13	1 μF	L3	Band Pass Filter Type No 163NEF1148WWJ (Toko Corp.)
R14	39 kΩ	C14	0.47 μF	L4	33 μH
R15	22 kΩ	C15	47 pF	L5	4.43 MHz Trap Type No LCS2H1H-102 (TDK Corp.)
R16	68 kΩ	C16	100 pF	L6	8.2 μH
R17	5.6 kΩ	C17	0.022 μF	Tr1	2SA733 (NEC)
R18	47 Ω	C18	0.022 μF	Xtal	4.43 MHz C _L = 16 pF or 20 pF
R19	470 Ω	C19	39 pF (Xtal C _L = 16 pF)	L.D.L.	Luminance Delay Line Type No CTS1804C (Showa Denso Corp.)
R20	1 kΩ	C20	68 pF (Xtal C _L = 20 pF)	1 H D.L.	1 H Delay Line Type No EFD EN (Matsushita Corp.)
R21	68 kΩ	C21	47 pF		
R22	470 kΩ	C22	18 pF		
R23	4.7 kΩ	C23	—		
R24	27 kΩ	C24	120 pF		
R25	27 kΩ	C25	100 pF		
R26	1 kΩ	C26	4.7 μF		
R27	(1.2 kΩ)				
R28	1 kΩ				
R29	1.5 kΩ				
R30	(1.2 kΩ)				
R31	3.3 kΩ				
R32	3.3 kΩ				
R33	3.3 kΩ				
R34	270 Ω				
R35	270 Ω				
R36	270 Ω				

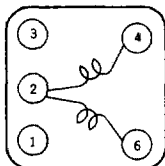
1 H Delay Line Matching Coil Specification

L1 Input Coil (PAL)



Type No. TKRNS - 24984NK
 Product TOKO Corp.
 f_o ; 4.43 MHz
 6-4 ; 18 T
 Cout ; 330 pF (4-6)
 Qu ; 59 ± 20 %
 Wire Material ; 0.1 / UEW

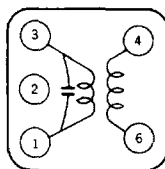
L2 Output Coil



Type No. TKRNS - 24985VN
 Product TOKO Corp.
 f_o ; 4.43 MHz
 4-2 ; 18 T
 2-6 ; 18 T
 Cout ; 75 pF (4-6)
 Qu ; 44 ± 20 %
 Wire Material ; 0.1 / 2UEW

Chrominance Input Coil Specification

L3 Input Coil (PAL)



Type No. 163NEF - 1148WWJ
 Product TOKO Corp.
 f_o ; 4.43 MHz
 6-4 ; 35 1/4 T
 3-1 ; 76 T
 Cout ; PH 47 pF
 Wire Material ; 0.1 / UEW