BIPOLAR ANALOG INTEGRATED CIRCUIT
μPC1365C

PAL CHROMINANCE AND LUMINANCE PROCESSOR
SILICON BIPOLAR MONOLITHIC INTEGRATED CIRCUIT

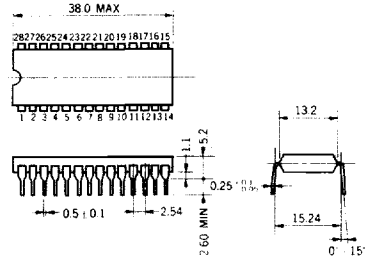
DESCRIPTION

μPC1365C 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.

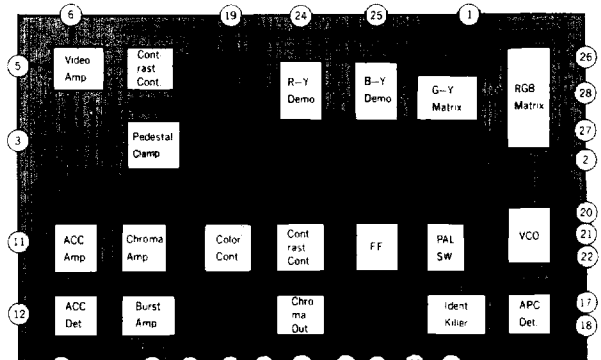
FEATURES

- This LSI has built-in function for PAL-SECAM dual system.
  1) Two ICs construction by NEC's SECAM IC μPC1364C2.
  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 hysterisis 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.

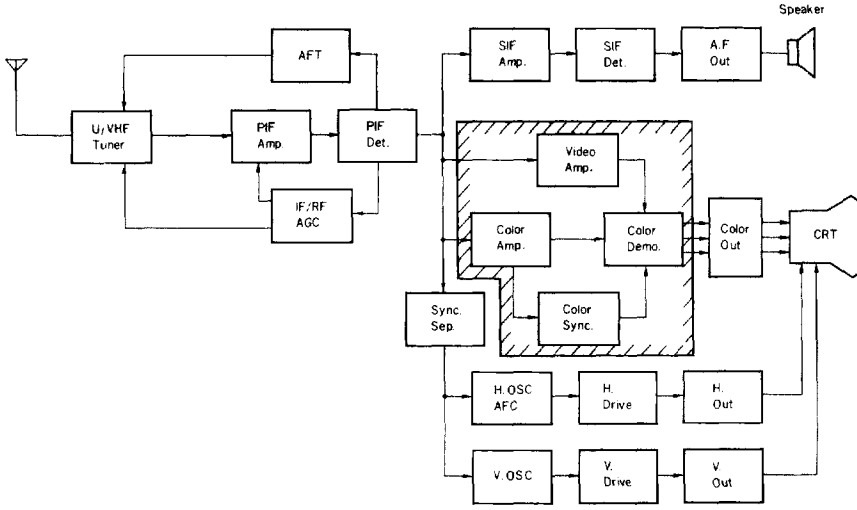
PACKAGE DIMENSIONS in millimeters



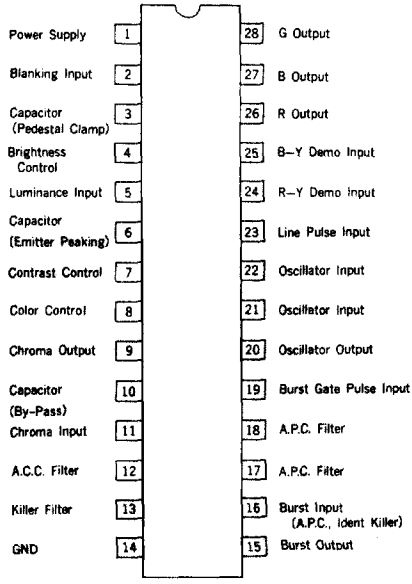
IC BLOCK DIAGRAM



TV BLOCK DIAGRAM



PIN CONNECTION (Top View)



μPC1365C 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

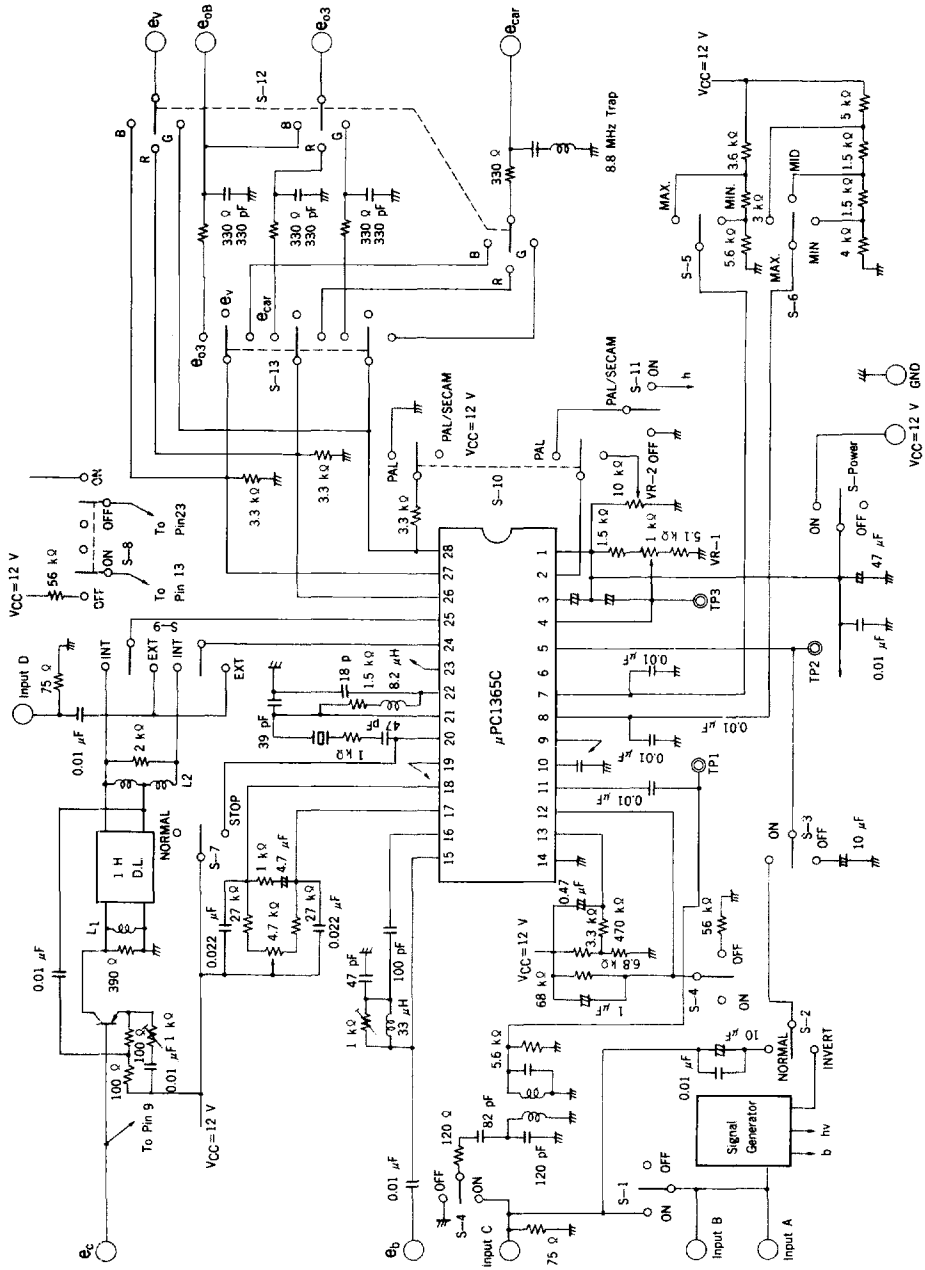
ABSOLUTE MAXIMUM RATINGS (Ta = +25 °C Unless otherwise)

Supply Voltage	V_{CC}		15	V
Power Dissipation	Pd	(Ta = +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, V_{CC} = 12 V)

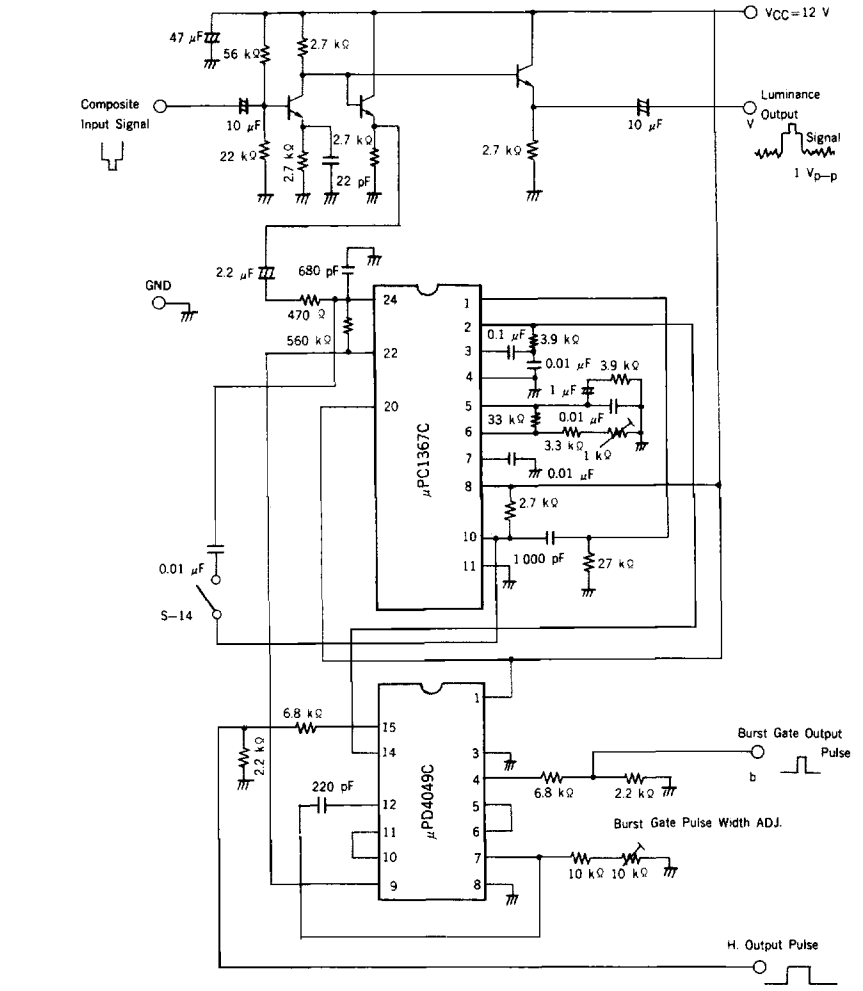
NO	CHARACTERISTIC	SYMBOL	TEST CKT	MIN.	TYP.	MAX	UNIT	TEST CONDITION
1	Burst Output Voltage	e_b	1	0.9	1.2	1.6	V_{p-p}	Input 100 mV_{p-p} Rainbow color bar signal
2	ACC Range	ACC	1	0.6	0.8	1.0	times	Input 10 mV_{p-p} Burst Output/ e_b
3	Chroma Output Voltage 1	e_{c1}	1	0.5	0.7	1.0	V_{p-p}	Input 100 mV_{p-p} 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	∠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	∠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	4.6	5.1	times	Input 1 V_{p-p} Color bar 100 % White signal Contrast control MAX

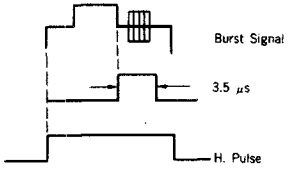
NO	CHARACTERISTIC	SYMBOL	TEST CKT	MIN.	TYP.	MAX	UNIT	TEST CONDITION
23	Relative Ratio of Luminance Gain	ΔAv1	1	–	1.0	1.1	times	Input 1 V_{p-p} Color bar 100 % White signal Contrast control MAX
24	Luminance Gain Variable Range by Contrast	e_{vc}	1	15	17	19	dB	Input 1 V_{p-p} Color bar 100 % White signal 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 Vr.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/ΔV4
29	Maximum R,G,B Output Voltage	E_{OM}	1	7	–	–	V	Brightness Controlling Voltage = 12 V
30	Quiescent Output Voltage	Eo	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 Ta = −20 to +70 °C V26 = 3.5 V at Ta = 25 °C
32	Difference Output Voltage	E_{R-G} E_{G-B} E_{B-R} E_{x-y}	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 Ta = 25 °C Ta = −20 to +70°C
34	Supply Current	I_{CC}	3	32	43	54	mA	V_{CC} = 12 V
35	Changing Black level by Contrast	ΔEoc	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



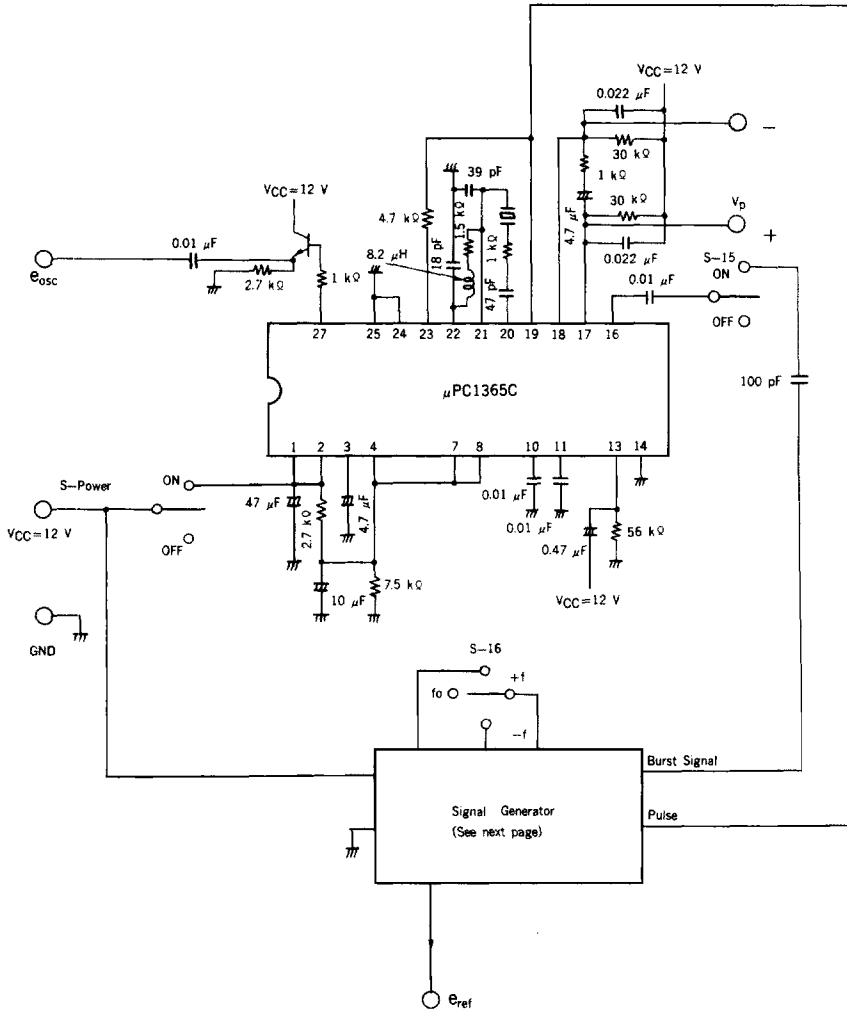
μPC1365C TEST CIRCUIT 1

μPC1365C Signal Generator (TEST CIRCUIT 1)

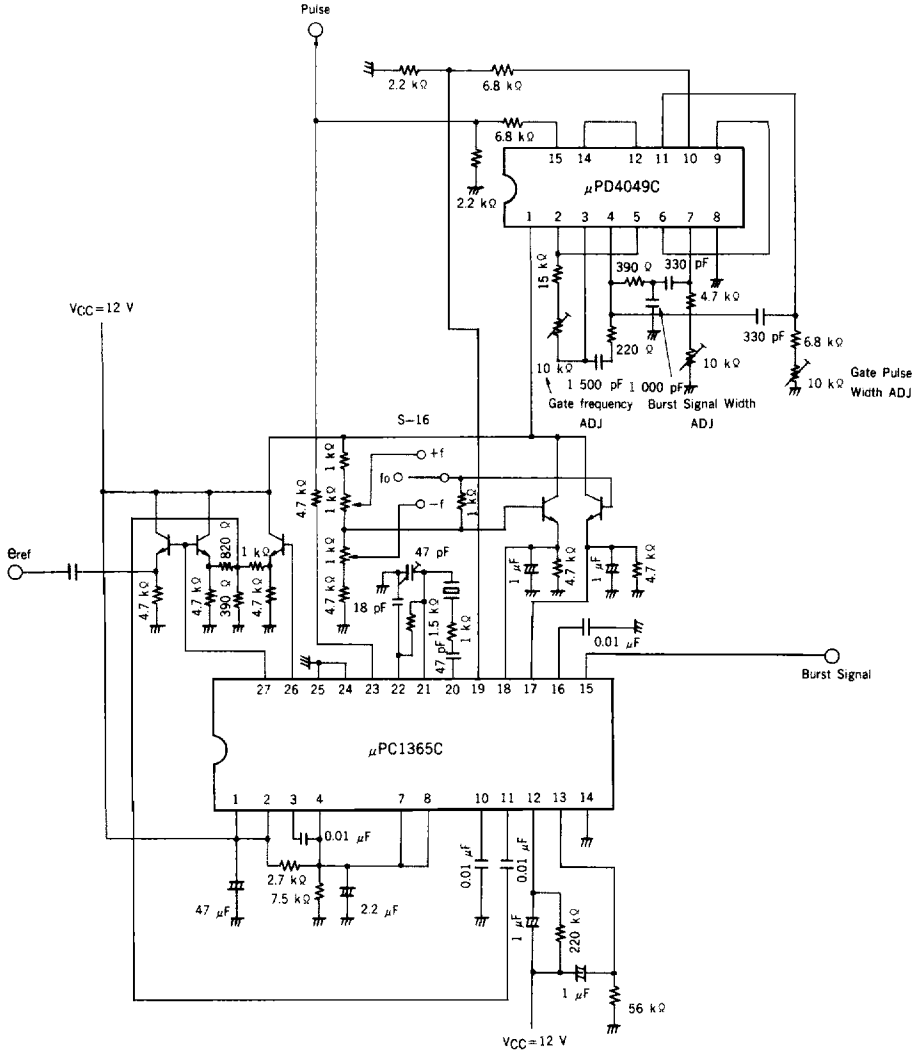




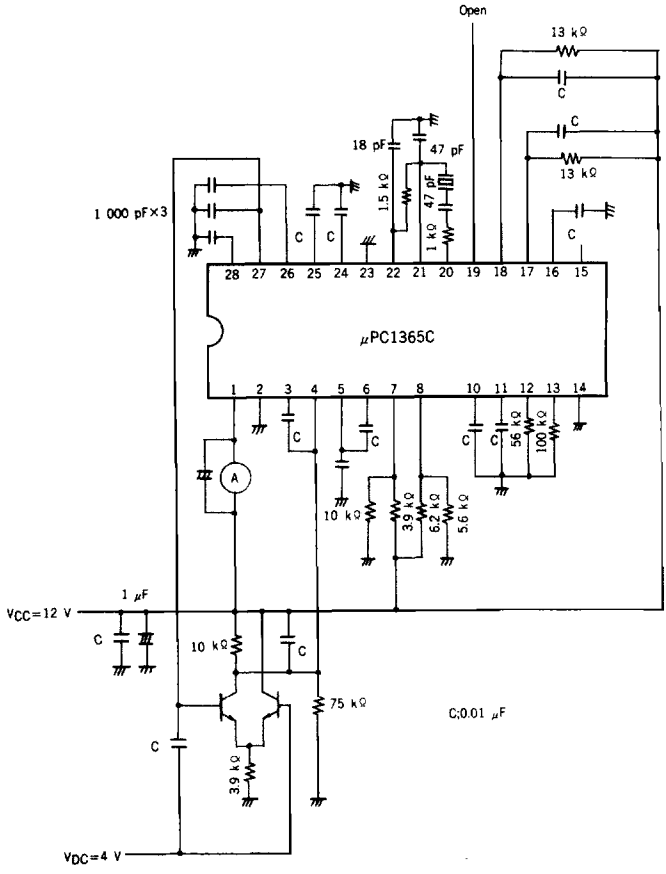
μPC1365C TEST CIRCUIT 2



μPC1365C 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	ATT				ATT		AC Volt meter		Phase Meter

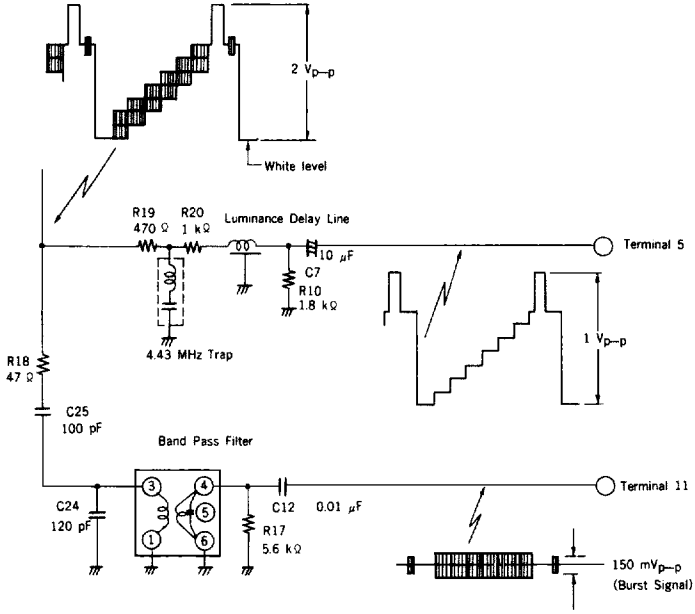
	∠G	e_{o2}	e_{car}	e_{o3}	e_{oc}	Av1, ΔAv1	e_{vc}	DG	T_{DC}	f_v
S-1 Input	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF
S-2 Lum.	INV	INV	INV	INV	INV	INV	INV	INV	INV	NORM
S-3 Lum.	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON
S-4 Chro.	OFF	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF
S-5 Cont.	MAX	MAX	MAX	MAX	MAX, MIN	MAX	MAX, MIN	MAX	MAX	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	Oscillo-scope	RF Volt meter

	BR	E_{oM}	E_o, E_{o-T}	$*E_{x-y}$ $\Delta E_{x-y}/\Delta T$	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_{o3}	e_{o3}	e_{o3}	e_{o3}	e_{o3}			
S-14	ON	ON	ON	ON	ON			
VR-1	See TEST Condition	TP = V_{CC}	TP = 9 V	V26 = 3.5 V	V 26 = 2 V			
VR-2								
Input								
SG								
Measure Point	E_{o3}	e_{o3}	e_{o3}	e_{o3}, e_{ov}	e_{o3}			
	DC Voltmeter							

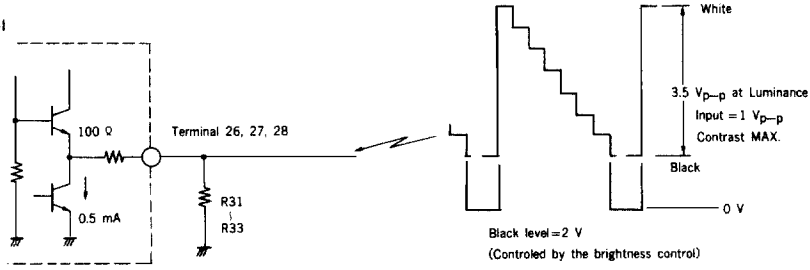
	β	μ	$\Delta\phi$	f_p	Vp
S-15 fo ± f	ON	ON	ON	OFF ON ON OFF	OFF
S-16 Burst	+f (100 Hz) −f (100 Hz)			+f (300 Hz) −f (300 Hz)	f_o
Measure Point	Vp e_{ref}	Vp e_{ref}, e_{osc}	e_{ref}, e_{osc}	e_{ref}	Vp
	f.Counter DC Voltmeter	Phase Meter f.Counter DC Voltmeter	Phase Meter f.Counter	f.Counter	DC Voltmeter

μPC1365C Input and Output signals

Luminance Input Signal



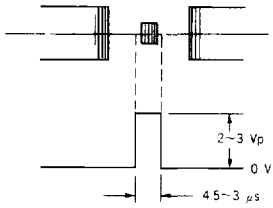
Output Signal

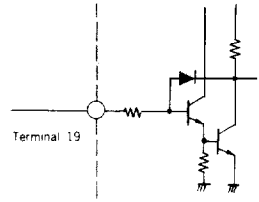


μPC1365C Input Pluse

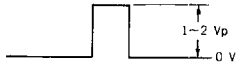
Burst Gate Pulse

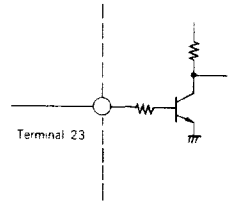
Burst signal = 100 ~ 200 mVp-p
at Terminal 11



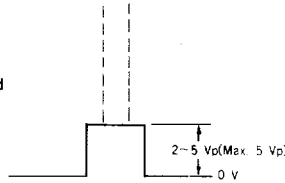


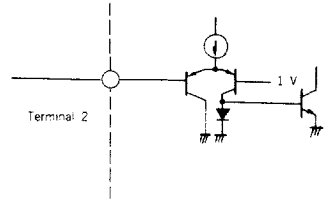
Line Pulse



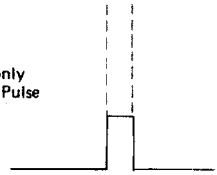


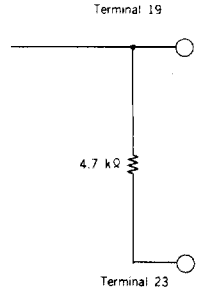
Blanking Pulse
(Line Pulse and
Field Pulse)





In case of commonly
using of Input Pulse

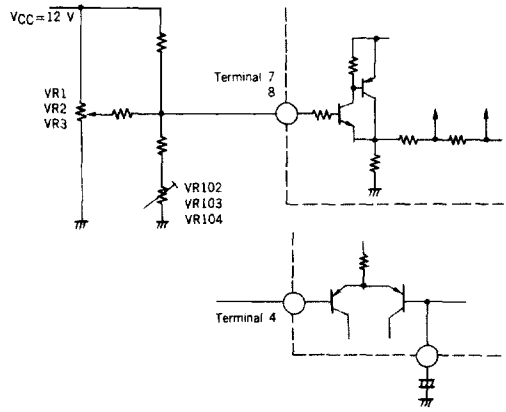




μPC1365C

*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

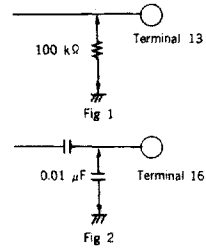
*Color Killer Setting VR105

*APC Setting

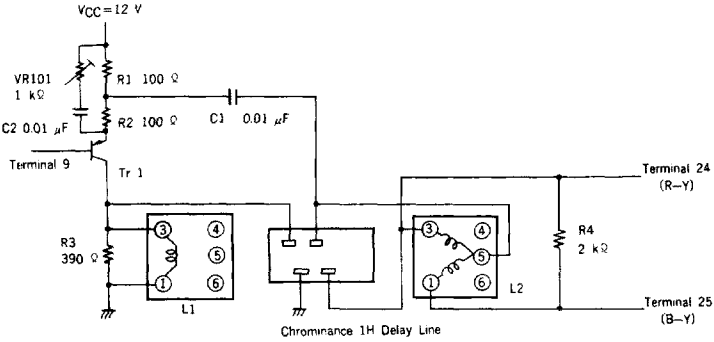
Method; 1; Be connected Resistor (100 kΩ) between the Terminal 13 and GND as shown Fig. 1 (Killer OFF)

2; Be connected Capacitor (0.01 μF) between the Terminal 16 and GND as shown Fig. 2 (Burst Input OFF)

3; Be trimed 4.433 618 MHz by using VR107

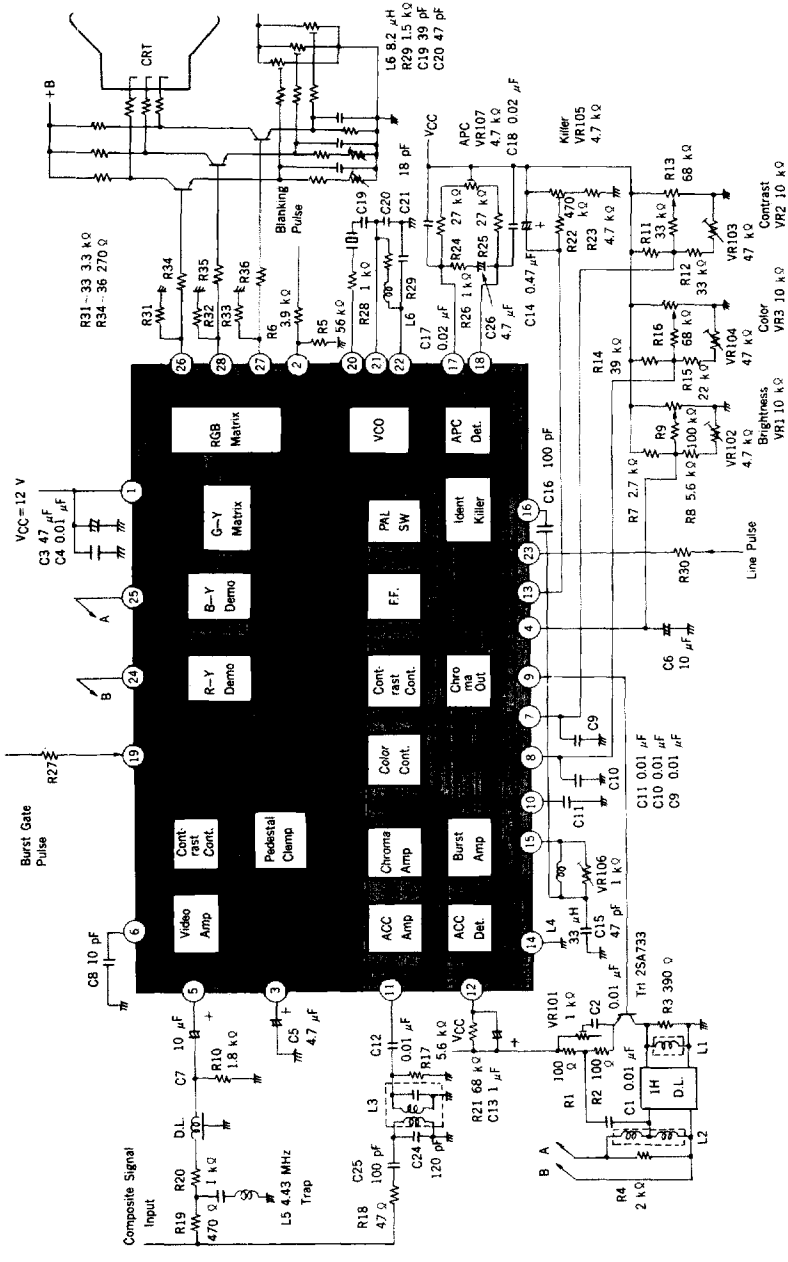


*1H Delay Line Circuit

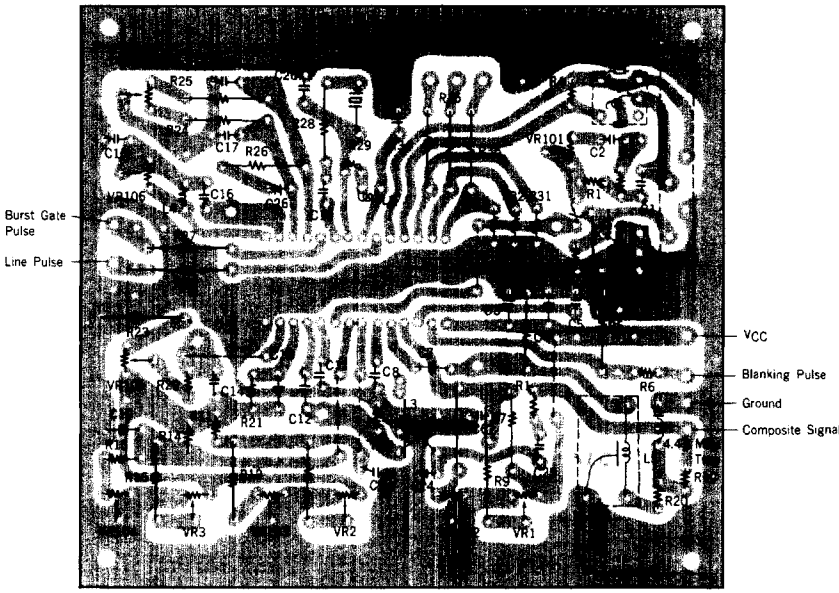


L1 ; Pre Chrominance Delay Line Terminating Coil
L2, VR101 ; Delay Phase and Amplitude Adjustment
VR106 ; Sub carrier Phase Adjustment

The Block Diagram and External Components for μPC1365C



Printed Circuit Board Pattern (Bottom View)

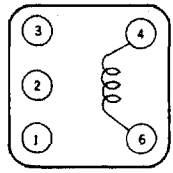


μPC1365C Table of the external components

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		
R5	(56 kΩ)	C5	4.7 μF	VR101	1 kΩ D.L. Level
R6	(3.9 kΩ)	C6	10 μF	VR102	4.7 kΩ Sub Brightness
R7	2.7 kΩ	C7	10 μF	VR103	47 kΩ Sub Contrast
R8	5.6 kΩ	C8	10 pF	VR104	47 kΩ Sub Color Saturation
R9	68 kΩ	C9	0.01 μF	VR105	4.7 kΩ Killer Adj
R10	1.8 kΩ	C10	0.01 μF	VR106	1 kΩ Phase Adj
R11	33 kΩ	C11	0.01 μF	VR107	4.7 kΩ APC Adj
R12	33 kΩ	C12	0.01 μF		
R13	68 kΩ	C13	1 μF	L1	D.L. Matching Coil Type No TKRNS 24984NK (Toko Corp.)
R14	39 kΩ	C14	0.47 μF	L2	D.L. Matching Coil Type No TKRNS 24985VN (Toko Corp.)
R15	22 kΩ	C15	47 pF	L3	Band Pass Filter Type No 163NEF1148WWJ (Toko Corp.)
R16	68 kΩ	C16	100 pF	L4	33 μH
R17	5.6 kΩ	C17	0.022 μF	L5	4.43 MHz Trap Type No LCS2H1H-102 (TDK Corp.)
R18	47 Ω	C18	0.022 μF	L6	8.2 μH
R19	470 Ω	C19	39 pF(Xtal C_L=16 pF), 68 pF(Xtal C_L=20 pF)	Tr1	2SA733 (NEC)
R20	1 kΩ			Xtal	4.43 MHz C_L=16 pF or 20 pF
R21	68 kΩ	C20	47 pF	L-D.L.	Luminance Delay Line Type No CTS-1804C (Showa Densei Corp.)
R22	470 kΩ	C21	18 pF	1 H D.L.	1 H Delay Line Type No EFD EN (Matsushita Corp.)
R23	4.7 kΩ	C22	—		
R24	27 kΩ	C23	—		
R25	27 kΩ	C24	120 pF		
R26	1 kΩ	C25	100 pF		
R27	(1.2 kΩ)	C26	4.7 μF		
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				

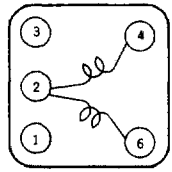
1 H Delay Line Matching Coil Specification

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

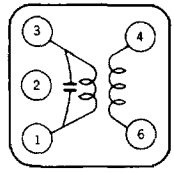
L2 Output Coil



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