M51307BSP

NTSC SYSTEM SINGLE-CHIP COLOR TV SIGNAL PROCESSOR

DESCRIPTION

The M51307BSP is a semiconductor integrated circuit with signal processing functions for video IF, sound IF, video, color, deflection signals and a single chip capable of processing color TV signals.

Combined with tuner and simple output stage of discreet transistors, it enables more rationalized designs of color TV sets.

FEATURES

● Large integration enables rationalization and high equipment reliability with low power consumption.

● A direct output pin for sound FM detector is provided, applicable to sound multiplexing.

● The most appropriate constants can be set by the synchronization separation input pins for horizontal and vertical deflection.

● No horizontal free run frequency adjustment.

● AFT defeat and sound muting capability.

● DC voltage controls picture quality, contrast, luminance, color saturation, Tint and volume.

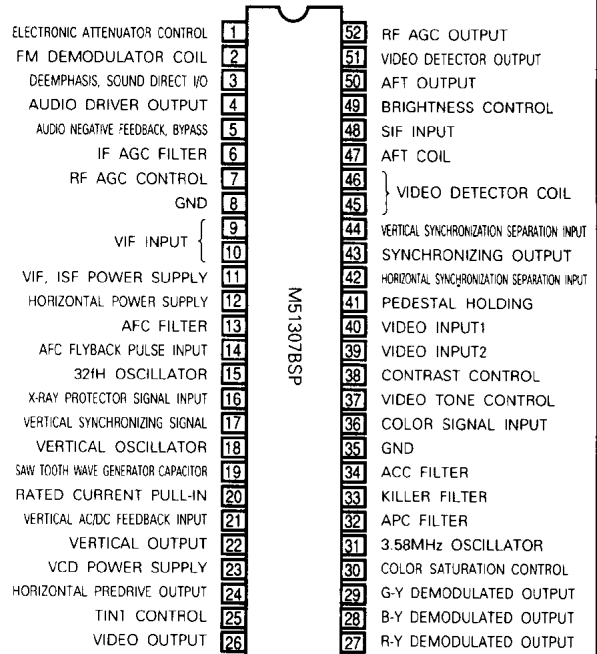● A52-pin shrink DIL package enables mounting in compact equipment.

APPLICATION

NTSC system color television set

RECOMMENDED OPERATING CONDITION

Supply voltage 9V
Horizontal supply current 14mA
Operating supply voltage .... 8.5~9.5V
Operating horizontal supply currents .... 12~16mA

PIN CONFIGURATION (TOP VIEW)

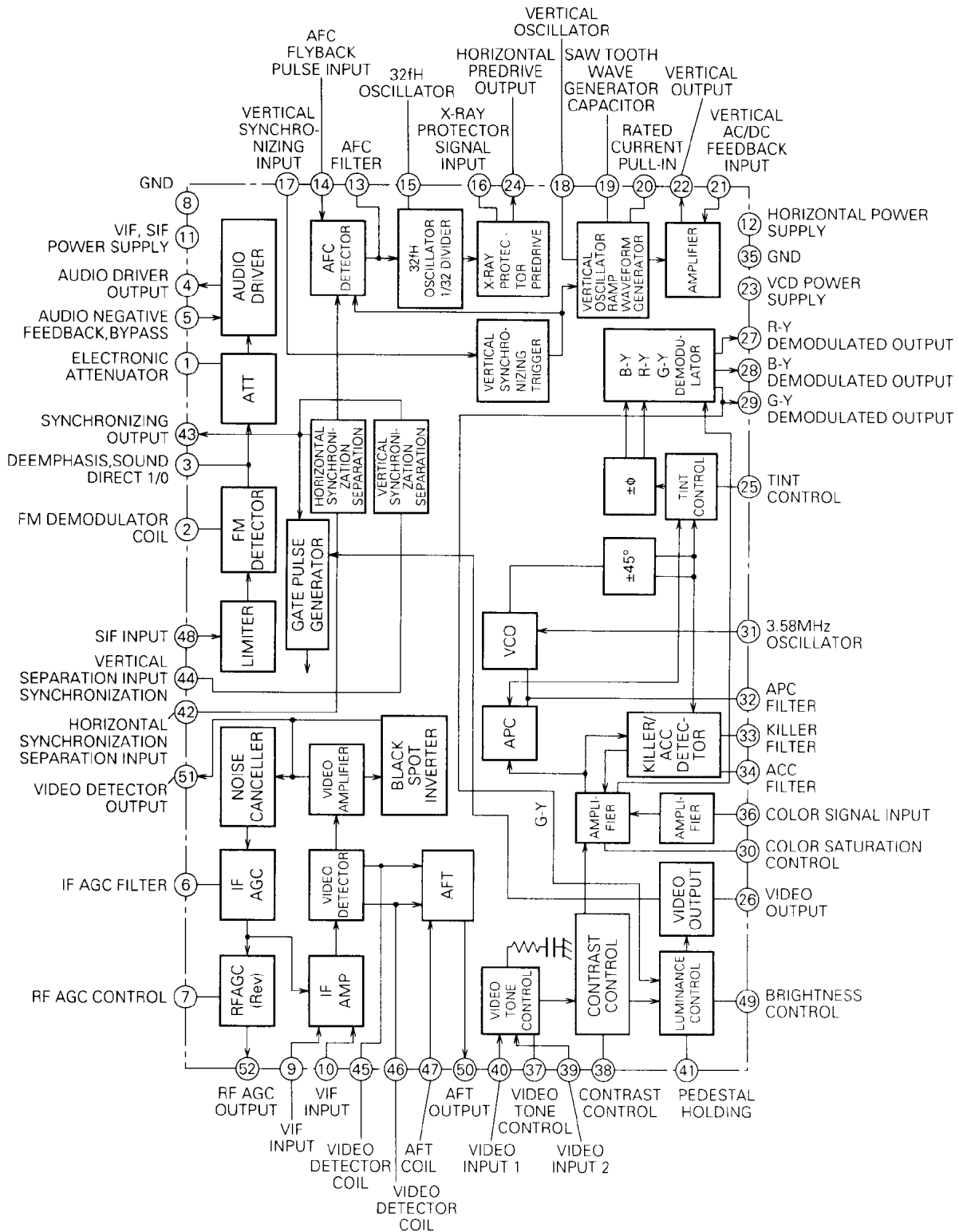| Pin	Left		Right	Pin
1	ELECTRONIC ATTENUATOR CONTROL		RF AGC OUTPUT	52
2	FM DEMODULATOR COIL		VIDEO DETECTOR OUTPUT	51
3	DEEMPHASIS, SOUND DIRECT I/O		AFT OUTPUT	50
4	AUDIO DRIVER OUTPUT		BRIGHTNESS CONTROL	49
5	AUDIO NEGATIVE FEEDBACK, BYPASS		SIF INPUT	48
6	IF AGC FILTER		AFT COIL	47
7	RF AGC CONTROL		VIDEO DETECTOR COIL	46
8	GND			45
9	VIF INPUT		VERTICAL SYNCHRONIZATION SEPARATION INPUT	44
10			SYNCHRONIZING OUTPUT	43
11	VIF, ISF POWER SUPPLY		HORIZONTAL SYNCHRONIZATION SEPARATION INPUT	42
12	HORIZONTAL POWER SUPPLY		PEDESTAL HOLDING	41
13	AFC FILTER		VIDEO INPUT1	40
14	AFC FLYBACK PULSE INPUT		VIDEO INPUT2	39
15	32fH OSCILLATOR		CONTRAST CONTROL	38
16	X-RAY PROTECTOR SIGNAL INPUT		VIDEO TONE CONTROL	37
17	VERTICAL SYNCHRONIZING SIGNAL		COLOR SIGNAL INPUT	36
18	VERTICAL OSCILLATOR		GND	35
19	SAW TOOTH WAVE GENERATOR CAPACITOR		ACC FILTER	34
20	RATED CURRENT PULL-IN		KILLER FILTER	33
21	VERTICAL AC/DC FEEDBACK INPUT		APC FILTER	32
22	VERTICAL OUTPUT		3.58MHz OSCILLATOR	31
23	VCD POWER SUPPLY		COLOR SATURATION CONTROL	30
24	HORIZONTAL PREDRIVE OUTPUT		G-Y DEMODULATED OUTPUT	29
25	TIN1 CONTROL		B-Y DEMODULATED OUTPUT	28
26	VIDEO OUTPUT		R-Y DEMODULATED OUTPUT	27

M51307BSP

Outline 52P4B

MITSUBISHI ELECTRIC

NTSC SYSTEM SINGLE-CHIP COLOR TV SIGNAL PROCESSOR

BLOCK DIAGRAM

NTSC SYSTEM SINGLE-CHIP COLOR TV SIGNAL PROCESSOR

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Ratings	Unit
V_{CC}	Supply voltage	11	V
P_d	Power dissipation	1.4	W
T_{opr}	Operating temperature	−20~65	°C
T_{stg}	Storage temperature	−40~125	°C

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

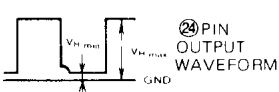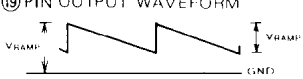| Symbol	Parameter	Test point	Input signal VIF	Input signal SIF	Ext. V_1	Ext. V_6	Ext. V_7	Sw 1	Sw 2	Sw 6	Sw 11	Sw 47	Test method	Min.	Typ.	Max.	Unit
VIF. SIF																	
$I_{CC(11)}$	Circuit current 11	A11			0		3	ON	OFF	OFF	2	OFF		27	36	48	mA
$V_{(51)}$	Video detector output DC voltage	TP.51			0	0	3	ON	ON	ON	1	OFF		4.5	4.9	5.3	V
$V_{O\ det}$	Video detector output	TP.51		SG2 90dBμ	0		3	ON	ON	OFF	1	OFF		1.7	2.0	2.3	V_{P-P}
$f_{B(v)}$	Video frequency characteristics	TP.51		SG5	0		3	ON	ON	OFF	1	OFF	(Refer to V-1)	−3	0	3	dB
P/N	Video S/N	TP.51A		SG1 90dBμ	0		3	ON	ON	OFF	1	OFF	Insert an LPF (which decreases the output voltage by 3dB at 5MHz) between TP.51 and TP.51A and measure output voltage in rms at TP.51A. $P/N=20log\left|\frac{Vodet(V_{P-P})\times 0.714}{noise(Vrms)}\right|$	46	54		dB
$V_{in(min)}$	Input sensitivity	TP.51		SG2 variable level	0		3	ON	ON	OFF	1	OFF	Input level at which detector output at TP.51 is decreased by 3dB from the measured Vodet by decreasing SG2 level.	44	51	57	dBμ
$V_{in(max)}$	Permissible maximum input	TP.51		SG3 variable level	0		3	ON	ON	OFF	1	OFF	Input level at which detector output is decreased by 3dB from V_A by increasing SG3 level when SG3 of 90dBμ is input and TP51 detector output = V_A	107	113		dBμ
GR	IF AGC control range												$GR=V_{in(max)}-V_{in(min)}$	54	62		dB
$V_{(50)}$	AFT output voltage	50			0	0	3	ON	ON	ON	1	OFF		3.0	4.3	5.6	V
μ_{AFT}	AFT detector sensitivity	50		SG6 90dBμ	0		3	ON	ON	OFF	1	OFF	(Refer to V-2)	40	60	100	mV/kHz
$V_{(50)H}$	AFT control voltage	50		SG7 90dBμ	0		3	ON	ON	OFF	1	OFF		8.0	8.6		V
$V_{(50)L}$	AFT control voltage	50		SG8 90dBμ	0		3	ON	ON	OFF	1	OFF			0.4	1.0	V
AFT_{SW}	AFT switch operation	50		SG6 90dBμ	0		3	ON	ON	OFF	1	ON	(Refer to V-3)	4.35	4.5	4.65	V
$V_{(52)H}$	RF AGC control voltage	52		SG1	0		1.5	ON	ON	OFF	1	OFF		6.8	7.7		V
$V_{(52)L}$	RF AGC control voltage	52		90dBμ	0		4.5	ON	ON	OFF	1	OFF			0.01	0.3	V
V_{BTH}	Black spot inverter threshold level	TP.51		SG6 90dBμ	0	Variable	3	ON	ON	ON	1	OFF	Measure each DC voltage	1.6	1.9	2.2	V
V_{BCL}	Black spot inverter clamp level	TP.51		SG6 90dBμ	0	Variable	3	ON	ON	ON	1	OFF		3.1	3.6	4.1	V
V_4	AF output DC voltage	4	—	—	0	0	3	ON	OFF		1	ON		2.7	3.3	4.0	V
$V_{O\ AFmax}$	AF maximum output	4	—	SG11 100dBμ	9	0	3	ON	OFF	ON	1	ON		0.55	0.9	1.4	Vrms
ATT	Maximum attenuation	4	—	SG11 100dBμ	0	0	3	ON	OFF	ON	1	ON	Measure pin 4 output $ATT=20log\left\{\frac{V_{O\ AFmax}(mVrms)}{Measured\ Vrms\ output}\right\}$	60	70		dB
THD_{AF}	AF output distortion	4	—	SG11 100dBμ	0	0	3	OFF	OFF	ON	1	ON			0.5	1.0	%
$V_{in(lim)}$	Input limiting sensitivity	4	—	SG11 variable level	9	0	3	ON	OFF	ON	1	ON	Input level at which detector output at pin 4 is decreased by 3dB from $V_{O\ AFmax}$ by decreasing SG11 level		50	58	dBμ
AMR	AMR	4	—	SG12 100dBμ	9	0	3	ON	OFF	ON	1	ON	Measure pin 4 output voltage $AMR=20log\left\{\frac{V_{O\ AFmax}(mVrms)}{Measured\ Vrms\ output}\right\}$	40	55		dB

MITSUBISHI ELECTRIC

NTSC SYSTEM SINGLE-CHIP COLOR TV SIGNAL PROCESSOR

ELECTRICAL CHARACTERISTICS (cont.)

Symbol	Parameter	Test point	Input signal VIF	Input signal SIF	External power supply (V) V_1	External power supply (V) V_6	External power supply (V) V_7	Switch setting 1	Switch setting 2	Switch setting 6	Switch setting 11	Switch setting 47	Test method	Min.	Typ.	Max.	Unit
VIF. SIF																	
S/N	AF S/N	4	—	SG10 100dBμ	9	0	3	ON	OFF	ON	1	ON	$S/N = 20\log\left(\dfrac{V_{O AFmax}(mVrms)}{\text{Measured value} mVrms}\right)$	60	70		dB
$V_{O AF3}$		TP. 3	—	SG11 100dBμ	0	0	3	ON	OFF	ON	1	ON		0.5	0.7	1.0	Vrms
MUTE		TP. 3	—	SG11 100dBμ	0	0	3	ON	ON	ON	1	ON	(Refer to S-1)	60	70		dB

Symbol	Parameter	Test point	Input signal J	Input signal V	Test method *SW is off, unless otherwise stated. The number in the ○ shows pin no.	Min.	Typ.	Max.	Unit
VCD									
V_{43HH}	Synchronization separation operation	43	SG22 +12dB		SW16=ON→0V, SW18,21,23=1, SW41=2	8.0	8.9		V_{O-P}
V_{43HL}					SW44=HH, HL=ON	2.6	3.1	3.6	
V_{43VH}					SW42=VH, VL=ON	8.0	8.9		
V_{43VL}					(Refer to Js-1)	2.6	3.1	3.6	
T_{BGP-I}	Gate pulse timing	41	SG22 +12dB		SW16=ON→0V, SW18,21,23=1, SW41=3 SW44=ON	0	0.8	1.5	μs
T_{BGP-II}					(Refer to Js-2)	2.5	3.5	5.0	
f_H	Free run frequency	24			Pin ㉔ output frequency when only ⑫ H. V_{CC} 9V is applied when SW16 = ON → 0V, SW18, 21, 23 = 1, SW41 = 2, SW42, 44 = ON	15.000	15.734	16.000	kHz
V_{12min}	Oscillator starting voltage	12 24			Applied voltage at pin ⑫ when the cycle of output waveform at pin㉔is approximately 63.5μs and the high voltage time span period is ≒ 31μs by gradually increasing the ⑫ H. V_{CC} from low voltage (≈ 2.0V) with SW = f_H.		4.3	5.3	V
f_{PH}	Pull-in range	24	SG22 +12dB Note		SW16=ON→0V, SW18,21,23=1, SW24=ON SW41=2 (Refer to J$_H$-1)		±500		Hz
$V_{H min}$	Output voltage	24			SW16=ON→0V SW42,44=ON SW18,21,23=1 SW41=2 ㉔ PIN OUTPUT WAVEFORM			0.3	V
$V_{H max}$						3.0	4.0		
V_{PRO}	Overvoltage protector circuit operating voltage	16			SW16=ON→ variable SW18,21,23=1 SW41=2, SW42,44=ON (Refer to J$_H$-2)	0.66	0.78	0.90	V
f_V	Free run frequency	21			SW16=ON→0V, SW22,44=ON Frequency at test point 21. Externally connected CRs SW18,23=1 at pin ⑱ are a capacitor of 0.27μF SW21,41=2 and a resistor of 107kΩ.	47	51.3	56	Hz
$V_{V min}$	Output voltage	22			SW16=ON→0V Pin ㉒ output voltage minimum SW18,21,23=1 voltage level (V_V min) SW41=2 SW44=ON Pin ㉒ output voltage maximum voltage level (V_V max)			0.3	V_{O-P}
$V_{V max}$						4.0	5.2		
V_{RAMP}	Ramp peak voltage	19			SW16=ON→0V ⑲PIN OUTPUT WAVEFORM SW18,23=1 SW21,41=2 SW22,44=ON	6.0	6.4	6.8	V_{O-P}
$\tilde{V}_{RAMP}$	Ramp amplitude					1.4	1.7	2.0	V_{P-P}
f_{PV}	Pull-in range	21	SG22 +12dB		SW16=ON→0V SW23=1 SW18,21,41=2 SW22,42,44=ON (Refer to J$_V$-1)	−15	−12		Hz
V_{23min}	Oscillator starting voltage	21 23			SW16=ON→0V, SW21,41=2 SW18,23=1, SW22=ON (Refer to J$_V$-2)		4.0	5.0	V
V_{23-P1}	Power supply voltage detector circuit operating voltage I	22 23 24			SW16=ON→0V SW18,21=1 SW23=1 variable (Refer to P-1 and P-2) SW41=2 SW42,44=ON	9.7	10.1	10.5	V
V_{23-P2}	II	22 23				3.7	4.1	4.5	

NTSC SYSTEM SINGLE-CHIP COLOR TV SIGNAL PROCESSOR

ELECTRICAL CHARACTERISTICS (cont.)

Symbol	Parameter	Test point	Input signal J	Input signal V or C	Test method *SW is off, unless otherwise stated. The number in the ○ shows pin no.	Limits Min.	Limits Typ.	Limits Max.	Unit
VCD									
I_{CC23}	Circuit current	A23	SG22 +12dB		SW16=ON→0V, SW22=ON SW18=1, SW21,23,41=2	20	27	36	mA
Y_{max}	Maximum output	26		SG23 +20dB	SW16=ON→0V, SW21=2, SW38=6.5V SW18,23,41=1, SW22,42,44=ON Adjust pin ㉛ externally applied voltage so that pin ㉖ DC voltage becomes 4.5V.	5.0	6.5		V_{P-P}
G_Y	Standard gain	26		SG23	SW16=ON→0V, SW18,23,41=1 SW21=2, SW22,42,44=ON (Refer to Y-1)	8.5	11.5	14.5	dB
G_Y norm	Contrast variation characteristics	26		SG23	SW16=ON→0V SW18,23,41=1 SW21=2 (Refer to Y-2) SW22,42,44=ON SW38=4.5V→2.5V→6.5V	−2	0	2	dB
G_Y min							−30	−26	
G_Y max						2	5	8	
V_{BRT} norm	Luminance variation characteristics	26	SG22 +12dB		SW16=ON→0V SW18,23=1 Measure DC voltage level SW21,41=2 during scanning of SW22=ON pin ㉖ output. SW49=5.2V→3.2V→7.2V	2.6	3.4	4.2	V_{O-P}
$V_{BRT L}$							1.2	2.0	
$V_{BRT H}$						5.4	6.0		
G_P	Peaking value	26		SG23 SG24	SW16=ON→0V, SW21=2 SW18,23,41=1, SW22,42,44=ON (Refer to Y-3)	6	9.5	13	dB
G_I norm	Picture quality variation characteristics	26		SG24	SW16=ON→0V SW18,23,41=1 SW21=2 (Refer to Y-4) SW22,42,44=ON SW37=4.5V→6.5V→2.5V	−2	0	2	dB
G_T min							−14	−10	
G_T max						2	4	8	
$f_{B(Y)}$	Frequency characteristics	26		SG26	SW16=ON→0V, SW21=2 SW18,23,41=1, SW22,42,44=ON (Refer to Y-5)	7	10.5	13	dB
$DG_{(Y)}$	Differential gain characteristics	26		SG23	SW16=ON→0V, SW21=2 SW18,23,41=1, SW22,42,44=ON (Refer to Y-6)		1	5	%
C_{max}	Demodulated maximum output	28	SG22 +12dB	SG28	SW16=ON→0V, SW21,41=2, SW30,38=6.5V SW18,23=1, SW22,24,26=ON (Refer to C-1)	3.3	4.2		V_{P-P}
C_{norm}	Demodulated typical output	27	SG22 +12dB	SG28	SW16=ON→0V, SW21,41=2 SW18,23=1, SW22,24,26=ON	2.1	2.6	3.1	V_{P-P}
ACC-Ⅰ	ACC characteristics	27	SG22 +12dB	SG28 −20dB	SW16=ON→0V V_A, V_B and V_C are output signal SW18,23=1 voltages at pin ㉗ when input SW21,41=2 levels are changed to 0, −20 and +6dB. SW22,24,26=ON $A_{CCⅠ}=20\log\frac{V_B}{V_A}$, $A_{CCⅡ}=20\log\frac{V_C}{V_A}$	−7.3	−2.3	2.7	dB
ACC-Ⅱ				SG28 +6dB		−3.2	−0.2	2.8	
C_S norm	Color control variation characteristics I	27	SG22 +12dB	SG28	SW16=ON→0V V_A, V_B and V_C are output signal SW18,23=1 voltages at pin ㉗ when color SW21,41=2 control voltages at pin ㉚ are SW22,24,26=ON changed to 4.5V, 2.5V and 6.5V. SW30=4.5V→2.5V→6.5V $C_{S min}=20\log\frac{V_B}{V_A}$, $C_{S max}=20\log\frac{V_C}{V_A}$ CS norm is shown by the variance against Cnorm.	−2	0	2	dB
C_S min							−43	−32	
C_S max						2	4.5	8	
C_U norm	Color control variation characteristics II	27	SG22 +12dB	SG28	SW16=ON→0V V_A, V_B and V_C are output signal SW18,23=1 voltages at pin ㉗ when contrast SW21,41=2 control voltages at pin ㊳ are changed SW22,24,26=ON to 4.5V, 2.5V and 6.5V. SW38=4.5V→2.5V→6.5V $C_{U min}=20\log\frac{V_B}{V_A}$, $C_{U max}=20\log\frac{V_C}{V_A}$ Cu norm is shown by the variance against Cnorm.	−1.5	0.5	2.5	dB
C_U min							−40	−30	
C_U max						2	4	8	
f_{PC}	APC pull-in range	27	SG22 +12dB	SG29 variable f	SW16=ON→0V, SW22,24,26=ON (Refer to C-2) SW18,23=1, SW21,41=2	±250	±500		Hz
V_{IK}	Killer operating input level	27	SG22 +12dB	SG29 variable level	SW16=ON→0V, SW21,41=2 (Refer to C-3) SW18,23=1, SW22,24,26=ON	−42	−35	−28	dB
V_{OK}	Killer color residual	28	SG22 +12dB	SG29 no burst	SW16=ON→0V, SW21,41=2, SW38=6.5V SW18,23=1, SW22,24,26=ON (Refer to C-4)		20	100	mV_{P-P}
R-Y / B-Y	Demodulated output amplitude ratio	27 / 28	SG22 +12dB	SG29 f_c-100 kHz	SW16=ON→0V SW18,23=1 SW21,41=2 (Refer to C-5) SW22,24,26=ON	0.84	0.91	0.98	—
G-Y / B-Y		29 / 28				0.24	0.29	0.34	

MITSUBISHI ELECTRIC

M51307BSP

NTSC SYSTEM SINGLE-CHIP COLOR TV SIGNAL PROCESSOR

ELECTRICAL CHARACTERISTICS (cont.)

Symbol	Parameter	Test point	Input signal J	Input signal V or C	Test method	*SW is off unless otherwise stated. The number in the ○ shows pin no.	Min.	Typ.	Max.	Unit
VCD										
V_{27}	Demodulated output voltage level	27	SG22 +12dB			SW16=ON→0V SW18,23=1 SW21,41=2 SW22,24,26=ON	4.7	5.1	5.5	V
V_{28}		28								
V_{29}		29								
V_{27-28}	Demodulated output offset voltage	27 28	SG22 +12dB			SW16=ON→0V, SW22,24,26=ON SW18,23=1 SW21,41=2	−0.3	0	0.3	V
V_{28-29}		28 29								
V_{29-27}		29 27								
C_{L-27}	Demodulated output residual carrier	27	SG22 +12dB			SW16→ON→0V SW18,23=1 SW21,41=2 SW22,24,26=ON			0.2	V_{P-P}
C_{L-28}		28								
C_{L-29}		29								
T	Tint control variation	27 28	SG22 +12dB	SG29	SW16=ON→0V, SW21,41=2, SW25=2.5V→6.5V SW18,23=1, SW22,24,26=ON (Refer to C-6)		75	90		deg
T_{min}	Tint control characteristics	27 28	SG22 +12dB	SG29	SW16=ON→0V SW18,23=1 Tmin 4.5V→2.5V SW21,41=2 Tgrad 4.5V→4.0V SW22,24,26=ON Tmax 4.5→6.5V (Refer to C-7) SW25=	−60	−40	−20	deg
T_{grad}						−53	−33	−13	deg
T_{max}						45	65	85	
$\angle_{R-Y}$	Demodulated phase angle	27 28	SG22 +12dB	SG29 fc-100 kHz	SW16=ON→0V SW18,23=1 SW21,41=2 SW22,24,26=ON	Set the same input conditions as C-9 demodulated output ratio and measure phase variation between output signal voltages at pins ㉗ and ㉙ and output signal voltage at pin ㉘		106		deg
$\angle_{G-Y}$		29 28						246		
ΔV_{Y-C}	Color tracking characteristics	26	SG22 +12dB	V input SG23	SW16=ON→0V, SW21=2, SW38=4.0V→4.5V SW18,23,41=1, SW22,42,44=ON (Refer to C-8)	−3	0	3	dB
		28		C input SG28	SW16=ON→0V, SW21,41,=2 SW18,23=1, SW22,24,26=ON				
V_{30K}	Pin 30 voltage	30	SG28 +12dB		SW16=ON→0V, SW21,41=2 SW18,23=1, SW22,24,26=ON		0.2	0.35	V

ELECTRICAL CHARACTERISTICS TEST METHOD

V-1 Video Frequency characteristics $f_{B(V)}$

1. Set SG5 as follows.

   f_1=58.75MHz, Vin=90dBμ
   f_2=57.75MHz, Vin=66dBμ } mixed signal

2. Measure the element of 1MHz at TP51 as V_A.

3. Set SG5 as follows.

   f_1=58.75MHz, Vin=90dBμ
   f_2=52.75MHz, Vin=86dBμ } mixed signal

4. Measure the element of 6MHz at TP51 as V_B.

5. $f_{B(V)}=20 \log \dfrac{V_B}{V_A}$ [dB]

V-2 AFT Detector Sensitivity μ_{AFT}

1. Input SG6 by 90dBμ.

2. Measure frequency difference when the DC voltage at pin 50 changes from 3.0V to 6.0V as Δf.

3. $\mu_{AFT} = \dfrac{3 \times 10^3 \text{ [MV]}}{\Delta f \text{ [kHz]}}$ [mV/kHz]

58.75MHz
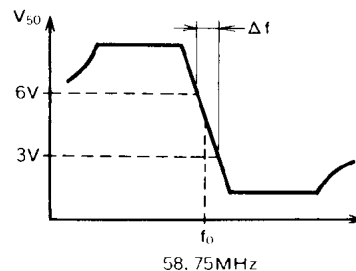
V-3 AFT Switching Operation AFT_{SW}

Switching operation is determined when the sweep waveform in the above fig. Reaches DC voltage level of approximately 4.5V with S47 on. The serial resistor is 1kΩ.

S-1 Muting Switching Operation MUTE

1. Measure output voltage at pin 4 when SG11 is input and S2 is on.

2. $MUTE = 20 \log \left\{ \dfrac{V_{OAF max} \text{ (mVrms)}}{\text{Measured Value (mVrms)}} \right\}$ [dB]

The serial resistor is 1kΩ.

NTSC SYSTEM SINGLE-CHIP COLOR TV SIGNAL PROCESSOR

JS-1 Sync, Separation Operation V_{43HH}, V_{43HL}, V_{43VH}, V_{43VL}
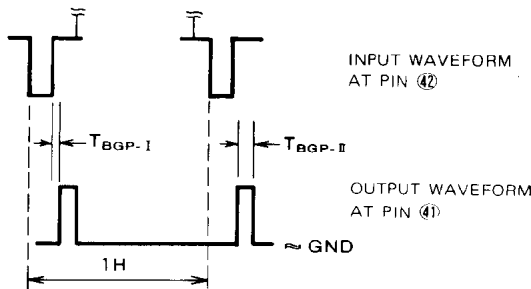
1. Measure output waveform at pin ㊸ when SG22 is input by +12dB ($2V_{p-p}$).
2. V_{43HH} is the maximum voltage at pin ㊸ when S44 is on and V_{43HL} is the minimum voltage.
3. V_{43VH} is the maximum voltage at pin ㊸ when S42 is on and V_{43VL} is the minimum voltage.

OUTPUT WAVEFORM
AT PIN ㊸

V_{43HL} V_{43HH}
V_{43VL} V_{43VH}

GND
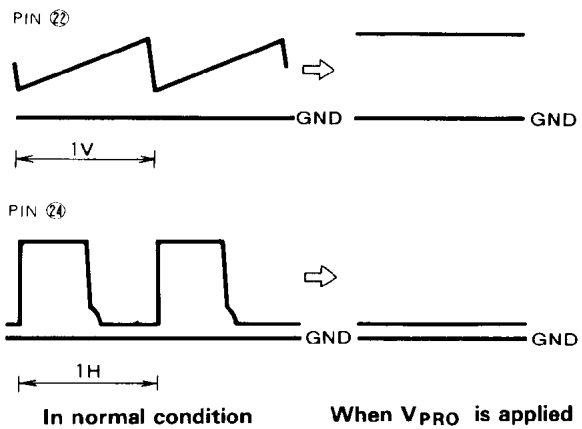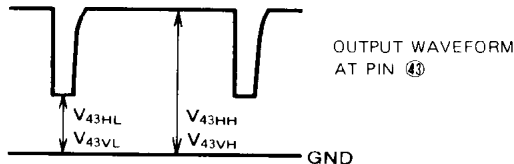
Js-2 Gate Pulse Timing T_{BGP-1}, T_{BGP-11}.

T_{BGP-1} is the delayed time after H SYNC of the input signal at pin ㊷.

T_{BGP11} is waveform time span at pin ㊶.

INPUT WAVEFORM
AT PIN ㊷

T_{BGP-I} T_{BGP-II}

OUTPUT WAVEFORM
AT PIN ㊶

≈ GND

1 H

JH-1 Pull-in Range f_{PH}

1. Set input signal and output waveform at pin ㉔ unsychronized by decreasing the frequency of SG22 input signal by a certain level.
2. Measure input signal frequency at the moment when input signal and output waveform at pin ㉔ is pulled in on synchronization by gradually increasing input signal frequency.
3. The pull-in range of the upperside is measured in the same manner.
4. f_{PH} is shown by the difference from standard frequency of 15734Hz.

JH-2 Overvoltage Protector Circuit Operating Voltage VPRO

The voltage is shown by the applied voltage at pin ⑯ when output waveforms at pins ㉒ and ㉔ become as in the following fig. by gradually increasing externally applied voltage with S16 on.

PIN ㉒

GND   GND

1V

PIN ㉔

GND   GND

1H

In normal condition   **When V_{PRO} is applied**

Jv-1 Pull-in Range f_{PV}

Measure frequency at test point 21 by increasing the externally connected resistor at pin ⑱ from the pulled in condition and fixing it at the instant when the input signal is not synchronized by turning the input signal off.

Jv-2 Oscillator Starting Voltage V23min

The voltage is the applied voltage at pin ㉓ which enables signal generation of approximately 19ms at test point 21 by gradually increasing the VCD system Vcc at pin ㉓ from low voltage (≈2.0V).

P1 Supply Voltage Detector Circuit Operating Voltage I $V_{23(P1)}$

1. Apply 9V to H.Vcc at pin ⑫.
2. Voltage is shown by applied voltage at pin ㉓ when the V.out waveform at pin ㉒ and H.out waveform at pin ㉔ can show the same movement as V_{PRO}, shown in the previous parameter, by gradually increasing VCD system Vcc from the standard voltage (9,0V).

P2 Supply Voltage Detector Circuit Operating Voltage II $V_{23(P2)}$

1. Apply 9V to H.Vcc at pin ⑫.
2. Voltage is shown by applied voltage at pin ㉓ when the V.out waveform at pin ㉒ and H.out waveform at pin ㉔ can show the same movement as V_{PRO}, shown in the previous parameter, by gradually decreasing VCD system Vcc at pin 12 from standard voltage (9.0V). (Note: H.out at pin ㉔ is not affected.)

MITSUBISHI ELECTRIC

Y-1 Standard Gain G_Y

1. Adjust externally applied voltage at pin ④ so that DC voltage at pin ㉖ becomes 3.0V.

2. $G_Y = 20 \log \dfrac{\text{㉖ Output Signal Voltage } mV_{p-p}}{200mV_{p-p}}$ [dB]

Y-2 Contrast Variation Characteristics $G_{Y\ norm}$, $G_{Y\ min}$, $G_{Y\ max}$

1. Adjust externally applied voltage at pin ④ so that the DC voltage at pin ㉖ becomes 3.0V.

2. Measure output signal voltages of V_A, V_B, and V_C when contrast control voltages are changed to 4.5, 2.5 and 6.5V at pin ㊳.

3. $G_{Y\ min} = 20 \log \dfrac{V_B}{V_A}$ [dB],

   $G_{Y\ max} = 20 \log \dfrac{V_C}{V_A}$ [dB],

Y-3 Peaking Voltage G_P

1. Adjust the externally applied voltage at pin ④ so that DC voltage at pin ㉖ becomes 3.0V.

2. V_A is the output signal voltage at pin ㉖ when SG23 is input and V_B is output signal voltage at pin ㉖ when SG24 is input.

3. $G_P = 20 \log \dfrac{V_B}{V_A}$ [dB]

Y-4 Picture Quality Variation Characteristics G_T, $G_{T\ norm}$, $G_{T\ min}$, $G_{T\ max}$

1. Adjust externally applied voltage at pin ④ so that DC voltage at pin ㉖ becomes 3.0V.

2. Measure output signal voltages of Y_A, Y_B and Y_C at pin ㉖ when video control voltages at pin ㊲ are changed to 4.5, 6.5 and 2.5V.

3. $G_{T\ min} = 20 \log \dfrac{V_B}{V_A}$ [dB],

   $G_{T\ max} = 20 \log \dfrac{V_B}{V_A}$ [dB],

   $G_{T\ norm}$ [dB] is the variation [dB] from V_B when G_P is measured.

Y-5 Frequency Characteristics $f_{B(Y)}$

1. Adjust externally applied voltage at pin ④ so that DC voltage at pin ㉖ becomes 3.0V.

2. V_A is the output signal voltage at pin 26 when SG23 is input and V_B is output signal voltage at pin 26 when SG26 is input.

3. $f_{B(Y)} = 20 \log \dfrac{V_B}{V_A}$ [dB]

Y-6 Differential Gain Characteristics $D_{G(Y)}$

1. V_A and V_B are output signal voltages at pin ㉙ when DC voltages at pin ㉖ are changed to 4.0V and 2.0V by adjusting the externally applied voltage at pin ④.

2. $D_{G(Y)} = \dfrac{[V_A - V_B]}{V_B} \times 100$ [%]

C-1 Demodulated Maximum Output C_{max}

Measure output signal voltage at pin ㊳ when color control voltage at pin ㉚ is 6.5V and contrast control voltage at pin ㉘ is 6.5 with input of SG28 (NTSC standard color bar signal).

C-2 APC Pull-in Range f_{PC}

Frequency range from the point that output signal voltage at pin ㉗ is non-existent, to the point that it occurs when SG29 is input and burst and chroma frequencies ($f_{SB} = f_{SC}$) are changed. Standard value is 3.57945MHz.

C-3 Killer Operation Input Level V_{ik}

Input level at which output signal voltage at pin ㉗ occurs from non-existent state by changing levels.

C-4 Killer Color Residual V_{OK}

Output signal at pin ㉘ when input conditions are set in which burst signal amplitude is $e_b = 0mV_{p-p}$. Chroma signal amplitude is $e_c = 100mV_{p-p}$ and frequency $f_{SC} = 3.579545MHz$.

C-5 Demodulated Output Ratio $\dfrac{R-Y}{B-Y}$, $\dfrac{G-Y}{B-Y}$

Ratio of output signal at pins ㉗ and ㉙ against output signal voltage at pin ㉘, in input conditions that burst signal amplitude is $e_b = 50mV_{p-p}$, chroma signal amplitude is $e_c = 100mV_{p-p}$, burst signal frequency $f_{SB} = 3.579545MHz$, chroma signal frequency. $f_{SC} = 3.479545MHz$, ($f_{SB} = -100kHz$).

C-6 Color Phase Control Variation T

Measure phase difference of output signal voltage at pin ㉗ when tint control voltage at pin ㉕ is changed to 2.5V and 6.5V with input SG29, on the synchroscope (X-Y display).

C-7 Color Phase Control Characteristics T_{min}, T_{grad}, T_{max}

Measure phase difference of output signal voltage at pin ㉗ when tint control voltage at pin ㉕ is changed to 4.5V, 2.5V, 4.0V and 6.5V with input of SG29, on synchroscope (X-Y display). Standard phase is at 4.5V.

NTSC SYSTEM SINGLE-CHIP COLOR TV SIGNAL PROCESSOR

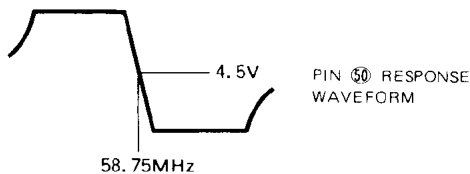### C-8 Color Tracking Characteristics ΔV$_{Y-C}$

1. Adjust externally applied voltage at pin ④ so that DC voltage at pin ㉖ becomes 3.0V and supply SG23 to input V.
2. Measure output signal voltage at pin ㉖ when contrast control voltage at pin ㊳ is changed to 4.0V and 4.5V as V$_A$ and V$_B$.
3. Supply the SG22(+12dB) to input J.
4. Input SG28 and measure output signal voltage at pin ㉗ when contrast control voltage is changed to 4.0V and 4.5V as V$_C$ and V$_D$.
5. $\Delta V_{Y-C}=20 \log \dfrac{V_B}{V_A} - 20 \log \dfrac{V_D}{V_C}$ [dB]

Method of Adjusting the Coils

1. Set measurement conditions equal to V$_{BTH}$ parameter.
2. The AFT coil must be unadjusted.
3. Check tank response at TP51 as shown in the fig. by setting the V6 (IF AGC filter pin voltage) variable. Adjust LLD coil so that peak is at 58.75MHz.
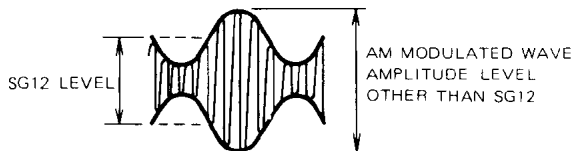

58.75MHz
NO SIGNAL DC VOLTAGE = 4.9V
0.3V
TP.51 RESPONSE WAVEFORM
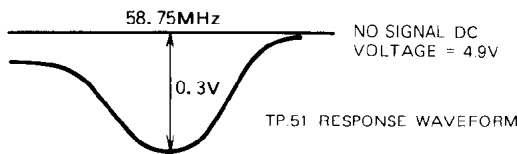
4. Adjust AFT coil to the condition in the μAFT parameter.


4.5V
PIN ㊿ RESPONSE WAVEFORM
58.75MHz

5. Adjust AFT coil conditions equal to THD$_{AF}$ parameter so that distortion is minimized.

Precautions for Input Signal

● Amplitude level of AM modulated waves other than SG12 is the peak level.

SG12 LEVEL
AM MODULATED WAVE AMPLITUDE LEVEL OTHER THAN SG12

● Use the mixer depicted in the following fig. Signal source impedance is 50Ω.

25Ω
25Ω   25Ω
25Ω
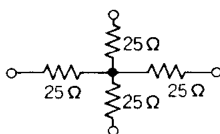
INPUT SIGNAL

SG. No.	Signal contents		
SG1	58.75MHz CW		
SG2	58.75MHz AM77.8%MOD. f$_m$ 20kHz		
SG3	58.75MHz AM16%MOD. f$_m$ 20kHz		
SG4	58.75MHz CW(90dBμ)+ 55.17MHz CW(76dBμ) / 54.25MHz CW(76dBμ)		
SG5	58.75MHz CW(90dBμ)+ 57.75MHz CW(66dBμ) / 52.75MHz CW(66dBμ)		
SG6	58.75MHz±2MHz CW		
SG7	57.75MHz CW		
SG8	59.75MHz CW		
SG9	58.75MHz, 87.5% video standard 10-stage wave modulator (f$_{SC}$ = 3.58MHz)		
SG10	4.5MHz CW		
SG11	4.5MHz FM±25kHzDEV. f$_m$ 400Hz		
SG12	4.5MHz AM30%MOD. f$_m$ 400Hz		
SG21	Typical synchronizing signal (0dB) 0.143Vp-p 5μs 63.5μs Includes V. synch.		
SG22	APL100% typical signal (0dB) 0.357Vp-p 0.143Vp-p 2μs 7.5μs 5μs 63.5μs Includes V. synch.		
SG23	200kHz CW (0dB) 0.2Vp-p 5μs		
SG24	2MHz CW (0dB) 0.2Vp-p 0.5μs		
SG25	4MHz CW (0dB) 0.2Vp-p 0.25μs		
SG26	6MHz CW (0dB) 0.2Vp-p 0.166μs		
SG27	3.579545MHz CW (0dB) 0.2Vp-p		
SG28	NTSC standard color bar signal f$_{SB}$ burst signal frequency f$_{SC}$ chroma signal frequency e$_b$ e$_c$ f$_{SB}$=f$_{SC}$=3.579545MHz 0dB e$_b$=50mVp-p e$_c$=100mVp-p		
SG29	NTSC simple chroma signal e$_c$ e$_b$ f$_{SB}$=f$_{SC}$=3.579545MHz (similar phase) 0dB e$_b$=50mVp-p e$_c$=100mVp-p		

Note: SG21, 22 and 28 timing must be matched. Refer to conditions and comments for signal levels.

MITSUBISHI ELECTRIC

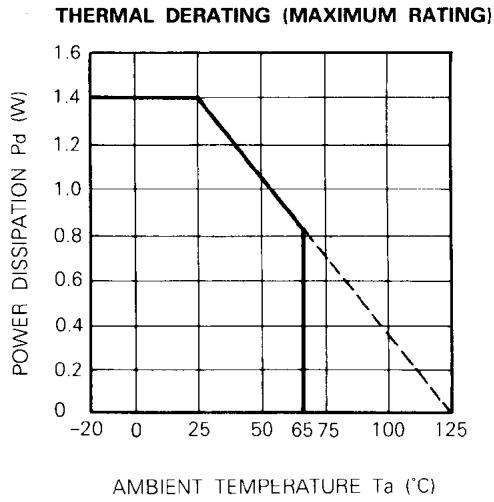## NTSC SYSTEM SINGLE-CHIP COLOR TV SIGNAL PROCESSOR

TEST CIRCUIT
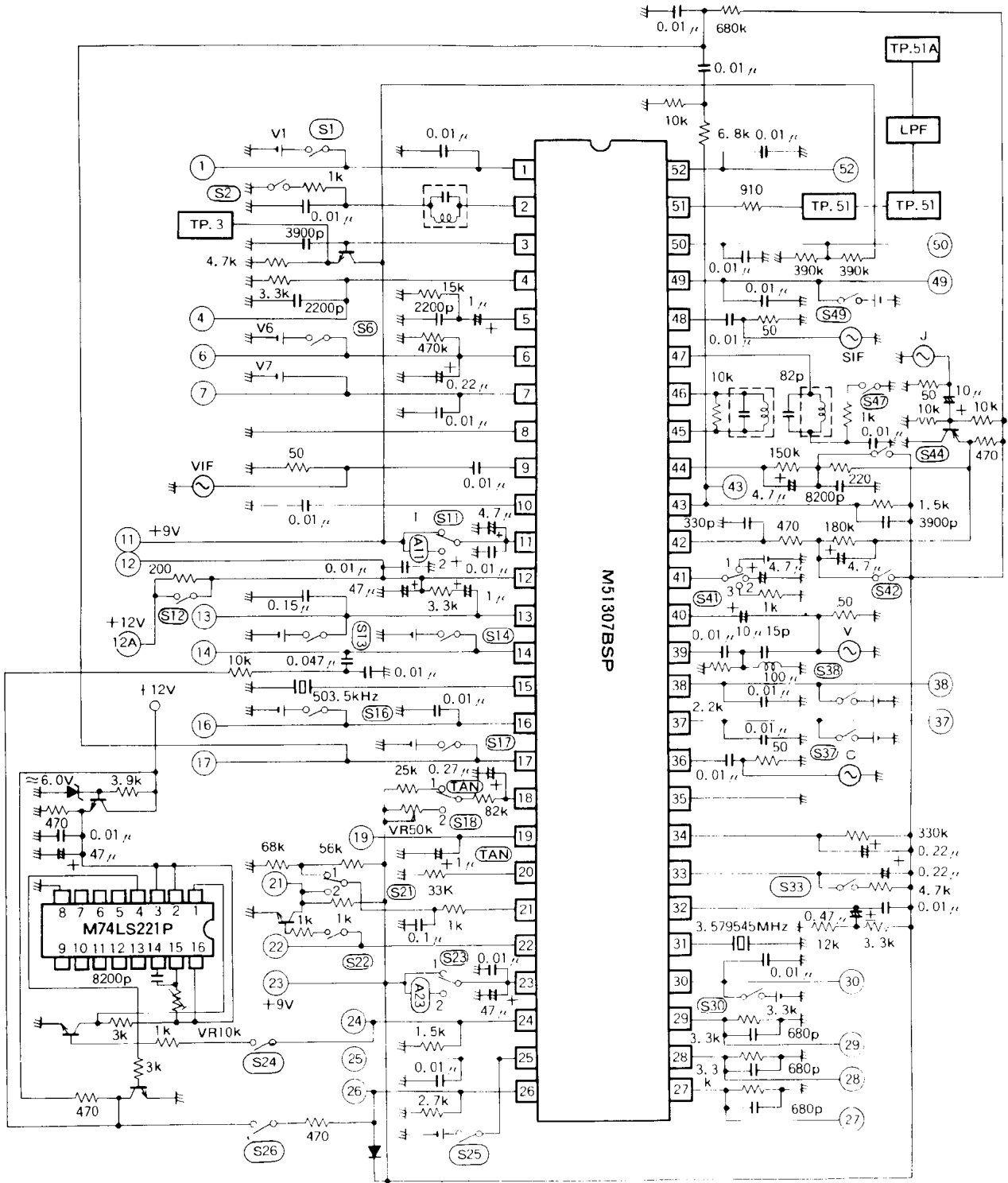
Units Resistance: Ω
Capacitance: F
Inductance: H

TYPICAL CHARACTERISTICS

THERMAL DERATING (MAXIMUM RATING)

AMBIENT TEMPERATURE Ta (°C)

(Y-axis: POWER DISSIPATION Pd (W))

MITSUBISHI ELECTRIC

NTSC SYSTEM SINGLE-CHIP COLOR TV SIGNAL PROCESSOR

APPLICATION EXAMPLE

Units Resistance: Ω
Capacitance: F