

M51397AP

SECAM CHROMA SYSTEM

DESCRIPTION

The M51397AP is a semiconductor integrated circuit for SECAM system color television receivers. It CONTAINS chroma processor, chroma demodulator, DC regenerator and system switches for PAL/SECAM dual system. Dual system color television receivers can be implemented by M51395AP (PAL chroma system and video processor) and M51397AP (SECAM chroma processor and system switch).

FEATURES

- Automatic mode switching for dual systems.
- Common delay line for dual systems.
- Minimum external components.
- Directly drives chroma output transistors.

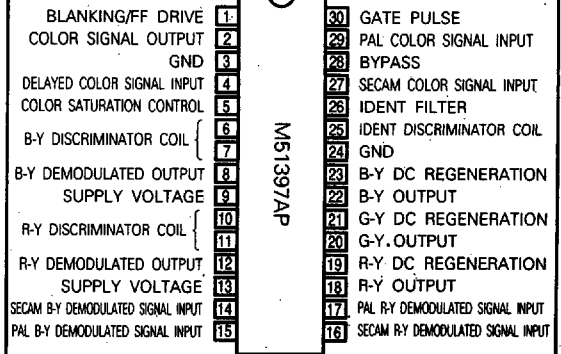
APPLICATION

SECAM system color TV, color signal processors

RECOMMENDED OPERATING CONDITION

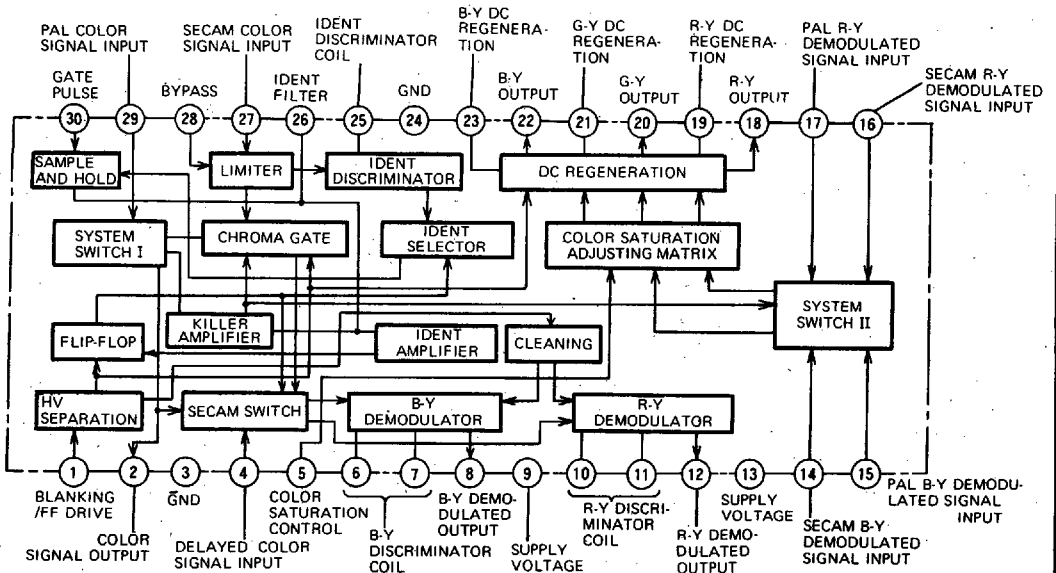
Supply voltage range.....11~13V
 Rated supply voltage12V

PIN CONFIGURATION (TOP VIEW)



Outline 30P4

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Ratings | Unit |
|------------------|-----------------------|---------|------|
| V _{CC} | Supply voltage | 16.0 | V |
| P _d | Power dissipation | 1400 | mW |
| T _{opr} | Operating temperature | -20~65 | °C |
| T _{stg} | Storage temperature | -40~125 | °C |

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

| Symbol | Parameter | Input signal | Conditions | | Meas. point | Limits | | | Unit | Note | | |
|-----------------------------|---|--------------|------------|----------------|--------------|--------------|--------|------|-------------------|-------------------|----|------------------|
| | | | Input | V _s | | Min. | Typ. | Max. | | | | |
| V _{CC} | Supply voltage | SG1 | 27 | 6 | 9, 13 | 10 | 12 | 14 | V | — | | |
| I _{CC} | Circuit current | SG1 | 27 | 6 | a | 55 | 75 | 88 | mA | — | | |
| V _{LIM} | Limiting output level | SG2 | 27 | — | 2 | 1.9 | 2.2 | 2.7 | V _{P-P} | 1 | | |
| G _{LIM} | Gain of limiter | | | | | 28 | 32 | 36 | dB | 2 | | |
| V _{OSS} | Output level of SECAM SW | SG1 | 27 | — | 6, 10 | 1.4 | 1.7 | 2.0 | V _{P-P} | — | | |
| G _{SW} | Gain of SECAM SW limiter | SG2 | 4 | — | | 12 | 18 | 24 | dB | 3 | | |
| V _{ODIS} | Output level of ident Disc. | SG2 | 27 | — | 25 | 0.48 | 0.59 | 0.70 | V _{P-P} | 4 | | |
| V _{IK} | Ident killer threshold level | SG1 | 27 | 6 | 18, 20 22 | 20 | 38 | 48 | 58 | dB | 5 | |
| V _{OK} | Killed output level | | | 8 | | — | 5 | 20 | mV _{P-P} | 6 | | |
| E _{OB-Y} | Demodulated output level | B-Y | SG1 | 27 | — | b, c | 0.86 | 0.98 | 1.13 | V _{P-P} | 7 | |
| E _{OR-Y} | | | | | | | R-Y | 0.58 | 0.68 | | | 0.78 |
| $\frac{E_{OR-Y}}{E_{OB-Y}}$ | Ratio of dem. output R-Y/B-Y | R-Y/ B-Y | SG1 | 27 | — | b, c | 0.60 | 0.70 | 0.80 | — | 8 | |
| Lin I | Linearity of dem. output | I | SG2 | 27 | — | b, c | 2.4 | 2.8 | 3.2 | — | 9 | |
| Lin II | | II | | | | | 2.2 | 2.6 | 3.0 | | | |
| ΔE _{OIH} | Offset voltage of SECAM SW | OFF | — | — | b, c | — | 5 | 20 | mV | 10 | | |
| ΔE _{O/IN} | Offset voltage vs input level | SG2 | 27 | — | b, c | — | 4 | 10 | mV | 11 | | |
| AMR | AMR | SG2 | 27 | — | | — | -30 | -25 | dB | 12 | | |
| V _{COL} | Color control voltage | OFF | — | — | 5 | 5.6 | 6.0 | 6.4 | V _{DC} | 13 | | |
| V _{SAT min} | Color saturation control | MIN | SG1 | 27 | 5 | 18, 20 22 | — | — | -20 | dB | 14 | |
| V _{SAT grad} | | GRAD | | | 5.78 | | -9.7 | -5.7 | -1.7 | | | |
| V _{SAT max} | | MAX | | | 7 | | 1.6 | 4.1 | 6.6 | | | |
| V _{SAT nor} | | NOR | | | 5.88 | | 2.8 | 4.0 | 5.6 | | | V _{P-P} |
| V _{OB-Y max} | Maximum non distortion output voltage | B-Y | SG1 | 27 | — | 22 | 4.1 | 5.1 | — | V _{P-P} | 15 | |
| V _{OR-Y max} | | R-Y | | | | | 18 | 3.0 | 3.8 | | | — |
| V _{OG-Y max} | | G-Y | | | | | 20 | 1.8 | 2.3 | | | — |
| V _{B-Y/R-Y} | Output ratio of matrix | (B-Y)/(R-Y) | SG1 | 27 | — | 22, 18 | 115 | 130 | 145 | % | 16 | |
| V _{G-Y/R-Y} | | (G-Y)/(R-Y) | | | | | 20, 18 | 52 | 60 | | | 68 |
| V ₁₈ | Demodulated output DC voltage | SG1 | 27 | 4 | 18 | 20 | 6.6 | 7.2 | 7.8 | V _{DC} | 17 | |
| V ₂₀ | | | | | | | | | | | | 22 |
| V ₂₂ | | | | | | | | | | | | 18 |
| ΔV ₁₈₋₂₀ | Offset voltage among output terminals | SG1 | 27 | 4 | 20 | 22 | -0.1 | 0 | 0.1 | V _{DC} | 18 | |
| ΔV ₂₀₋₂₂ | | | | | | | | | | | | |
| ΔV ₂₂₋₁₈ | | | | | | | | | | | | |
| V _{CR B-Y} | Cross talk of system SW (PAL-SECAM) | I | SG3 | 14, 16 | 6 | 22, 18 | — | 40 | 100 | mV _{P-P} | 19 | |
| V _{CR R-Y} | | II | | 15, 17 | | | | | | | | |
| V _{OB-Y min} | Output voltage at minimum color control | I | SG3 | 14, 16 | 4 | 18, 20 22 | — | 20 | 50 | mV _{P-P} | 20 | |
| V _{OR-Y min} | | II | | 15, 17 | | | | | | | | |
| E _{CR B-Y} | Cross talk of demodulator | B-Y | SG1 | 27 | 8 | 22 | 33 | 38 | — | dB | 21 | |
| E _{CR R-Y} | | R-Y | | | | | | | | | | 18 |



ELECTRICAL CHARACTERISTICS (cont.)

| Symbol | Parameter | Input signal | Conditions | | Meas. point | Limits | | | Unit | Note | | |
|-----------------------------------|--|--------------|------------|----------------|-------------|--------|------|------|------|-------------------|------------------|----|
| | | | Input | V _s | | Min. | Typ. | Max. | | | | |
| V ₄ | DC voltage at SECAM SW ④ | I | OFF | — | — | 4 | 2.2 | 2.8 | 3.4 | V _{DC} | 22 | |
| V _{4 min} | | II | — | — | — | — | 0 | 0.5 | | | | |
| ΔE _{O I} | Offset voltage of demodulated voltage between each H | I | SG1 | 27 | — | b, c | — | 10 | 20 | mV _{DC} | 23 | |
| ΔE _{O II} | | II | SG2 | 27, 4 | — | | — | 20 | 50 | | | |
| ΔV _{OR-Y/H} | Offset voltage of output between each H | | SG1 | 27 | 6 | | 18 | — | 20 | 30 | mV _{DC} | 24 |
| ΔV _{OB-Y/H} | | | | | | | 22 | | | | | |
| ΔV _{R-Y/COL} | DC offset voltage vs color control | | OFF | — | — | | 18 | -30 | 0 | 30 | mV _{DC} | 25 |
| ΔV _{G-Y/COL} | | | | | | | 20 | | | | | |
| ΔV _{B-Y/COL} | | | | | | | 22 | | | | | |
| ΔV _{B-R/COL} | | | | | | | 18 | | | | | |
| ΔV _{R-G/COL} | DC offset voltage among outputs vs color control | | OFF | — | — | | 20 | -30 | 0 | 30 | mV _{DC} | 26 |
| ΔV _{G-B/COL} | | | | | | | 22 | | | | | |
| ΔV _{O I} | | | | | | | 22 | | | | | |
| V _{OR-YSII} | Output voltage of system SW II/DC-clamp | I | SG3 | 14, 16 | 8 | | 18 | 2.1 | 2.6 | 3.1 | V _{P-P} | 27 |
| V _{OB-YSII} | | II | | 15, 17 | | | 22 | | | | | |
| V _{OS I} | Output voltage of system SW I | | SG2 | 29 | — | 2 | 1.5 | 1.9 | 2.3 | V _{P-P} | 30 | |
| ΔE _{OCR I} | Crosstalk of system SW I | I | SG2 | 27 | — | 2 | — | 40 | 100 | mV _{P-P} | 31 | |
| ΔE _{OCR II} | | II | | 29 | | | — | | | | | 70 |
| ΔE _{OB-Y/V_{CC}} | Change of demodulated output vs V | | SG1 | 27 | — | | b | 0.06 | 0.09 | 0.12 | 1/V | 28 |
| ΔE _{OR-Y/V_{CC}} | | | | | | | c | | | | | |
| ΔE _{OB-Y/Ta} | Change of demodulated output vs T | | SG1 | 27 | — | | b | -2 | 0 | 2 | mV/°C | 29 |
| ΔE _{OR-Y/Ta} | | | | | | | c | | | | | |
| ΔV _{OR-Y/V_{CC}} | Change of output voltage vs V | | SG1 | 27 | 8 | | 18 | 0.09 | 0.13 | 0.16 | 1/V | 28 |
| ΔV _{OG-Y/V_{CC}} | | | | | | | 20 | | | | | |
| ΔV _{OB-Y/V_{CC}} | | | | | | | 22 | | | | | |
| ΔV _{OR-Y/Ta} | Change of output voltage vs T | | SG1 | 27 | 8 | | 18 | -30 | 0 | 30 | mV/°C | 29 |
| ΔV _{OG-Y/Ta} | | | | | | | 20 | | | | | |
| ΔV _{OB-Y/Ta} | | | | | | | 22 | | | | | |
| ΔV _{OB-R/V_{CC}} | Offset voltage among output terminals vs V | | OFF | — | — | | 18 | -25 | 0 | 25 | mV/V | 32 |
| ΔV _{OR-G/V_{CC}} | | | | | | | 20 | | | | | |
| ΔV _{OG-B/V_{CC}} | | | | | | | 22 | | | | | |
| ΔV _{OB-R/Ta} | Offset voltage among output terminals vs T | | OFF | — | — | | 18 | -1 | 0 | 1 | mV/°C | 29 |
| ΔV _{OR-G/Ta} | | | | | | | 20 | | | | | |
| ΔV _{OG-B/Ta} | | | | | | | 22 | | | | | |

| Symbol | Parameter | Meas. point | Limits | | | Unit | |
|----------------------|---|-------------|--------|------|------|------|------------------|
| | | | Min. | Typ. | Max. | | |
| V _{G on} | Gate pulse | | 30 | 1.4 | — | — | V _{O-P} |
| V _{G off} | | | | — | — | 0.5 | |
| V _{BLK on} | Blanking pulse | | 1 | 6.8 | — | — | V _{O-P} |
| V _{BLK off} | | | | — | — | 5.6 | |
| V _{FF on} | F.F. drive pulse | | 1 | 10.8 | — | — | V _{O-P} |
| V _{FF off} | | | | — | — | 8.9 | |
| V _{i max} | Maximum chroma input signal at limiter | | 27 | — | — | 3.0 | V _{P-P} |
| V _{i dly} | Input signal level at delayed input of SECAM SW | | 4 | 0.6 | 0.8 | 1.2 | V _{P-P} |
| V _{iSS max} | Maximum input level of system SW | | 14-17 | — | — | 1.2 | V _{P-P} |

ELECTRICAL CHARACTERISTICS (cont.)

| Symbol | Parameter | Test terminal | Limits | | | Unit |
|-----------|---------------------------------|-------------------------------------|--------|------|------|------------|
| | | | Min. | Typ. | Max. | |
| Ri (SEC) | SECAM Chroma input resistance | Pin 27 | — | 2.5 | — | k Ω |
| Ci (SEC) | SECAM Chroma input capacitance | Pin 27 | — | 1.6 | — | pF |
| Ri (PAL) | PAL Chroma input resistance | Pin 29 | — | 3.0 | — | k Ω |
| Ro (C) | Chroma output resistance | Pin 2 R _L =1.2k Ω | — | 20 | — | Ω |
| Ri (SW) | SECAM Switch input resistance | Pin 4 | — | 2.0 | — | k Ω |
| Ci (SW) | SECAM Switch input capacitance | Pin 4 | — | 3.5 | — | pF |
| Ro (DISC) | SECAM SW Output impedance | Pins 6, 10 | — | 200 | — | Ω |
| Ri (DISC) | Discriminator input resistance | Pins 7, 11 | — | 1.8 | — | k Ω |
| Ci (DISC) | Discriminator input capacitance | Pins 7, 11 | — | 3.0 | — | pF |
| Ro (DISC) | Discriminator output resistance | Pins 8, 12 | — | 300 | — | Ω |
| Ri (SYS) | System switch input resistance | Pins 14, 15, 16, 17 | — | 4.0 | — | k Ω |
| Ro (REG) | Demodulator output resistance | Pins 18, 20, 22 | — | 300 | — | Ω |

ELECTRICAL CHARACTERISTICS TEST METHOD

Note:1 V₀ (@SW3 → ON. Input signal
f=4.3MHz, V₀=100mV_{P-P})

Note:2 20log (V₀-1/V₀-2), where V₀-1 (100mV_{P-P})
→ V₀-2 (@V₀ → 0), f=4.3MHz

Note:3 Same as Note 2 (input V₀-1, 1V_{P-P}, f=4.3MHz)

Note:4 Input signal f=4.328MHz, 200mV_{P-P}

Note:5 20log (V₀-1/V₀-2) where V₀-1 (100mV_{P-P})
→ V₀-2 (@V₀ → 0)

Note:6 Measured after eliminating SYNC pulses.

Note:7 Center Value of carrier @SW₂ → b, c

Note:8 V_b/V_c

Note:9 Output linearity (I) = $\frac{(V_0 \text{ at } f_0 + 300\text{kHz}) - (V_0 \text{ at } f_0)}{(V_0 \text{ at } f_0 + 100\text{kHz}) - (V_0 \text{ at } f_0)}$

Output linearity (III) = $\frac{(V_0 \text{ at } f_0 - 300\text{kHz}) - (V_0 \text{ at } f_0)}{(V_0 \text{ at } f_0 - 100\text{kHz}) - (V_0 \text{ at } f_0)}$

SW₂ → d, e, SW₃ → ON, 2200pF at b, c

Reference Signal at b: 4.406MHz (f_{OR}), 200mV_{P-P}

Reference Signal at c: 4.25MHz (f_{OS}), 200mV_{P-P}

Note:10 V₀ at 1H, (SW₂ → d, e, SW₃ → ON, SW₄ → ON,
SW₅ → ON)

Note:11 ΔV_0 at 20dB change of input signal

SW₂ → d, e, SW₃ → ON, SW₄ → ON, SW₅ → ON

Reference signal at b: 4.406MHz, 200mV_{P-P}

Reference signal at c: 4.25MHz, 200mV_{P-P}

DC Voltage between blanking interval and signal interval are adjusted to same voltage by L₁, L₂.

Note:12 20log VA/VF (db)

SW₂ → d, e, SW₃ → ON, Input signal voltage 200mV_{P-P} without SYNC

Output voltage VF: SG2 4.25MHz, 4.406MHz FM modulated by fm=400Hz, 75kHz

Output voltage VA: SG2 4.25MHz, 4.406MHz AM modulated by fm=400Hz, 30%

Note:13 V₀ at No Load.

Note:14 $\frac{V_0 \text{ at } V_0}{V_0 \text{ at } V_0 = 6V}$ (dB) (SW₂ → b, c, SW₆ → k, l)

Note:15 Maximum Output Voltage without distortion at a change of V₀

Note:16 $\frac{V_0 \text{ (B-Y)} - V_0 \text{ (G-Y)}}{V_0 \text{ (R-Y)} - V_0 \text{ (R-Y)}}$ (V₀ (R-Y)=2V_{P-P})

Note:17 DC voltage at V₀=4V

Note:18 V₀-V₀, V₀-V₀, V₀-V₀ (at V₀=4V)

Note:19 SG3=0.4V_{P-P}, 500kHz V₀=6V SW₂→d, e

I (Crosstalk SECAM → PAL)

Each output level at SW₅→ON, SW₆→k, l

II (Crosstalk PAL → SECAM)

Each output level at SW₃→ON, SW₅→OFF, SW₆→m, n

Note:20 Same measurement as Note:23 at V₀ = 4V

Note:21 Ratio of output voltage between each line (dB), at SW₂ → d, e, SW₄ → ON

Note:22 I V₀ DC at SW₃ → ON

II V₀ DC at SW₅ → ON

Note:23 I Difference of output level between each line at SW₂ → d, e

II Difference of output level between each line at SW₁ → 2 SW₂ → d, e, V₀ → 1V_{P-P}

Frequency at pin 27 and 4 are same (4.25 and 4.406MHz)

V₀ 1V_{P-P}+3dB ~ 1V_{P-P}-3dB

Note:24 Difference of output level between each line at SW₂ → b, c, SW₆ → k, l

Note:25 Difference of DC output voltage between as the change of color control

Note:26 Difference of DC output voltage between each output as the change of color control

Note:27 Output level at SG 0.4 V_{P-P}, 500kHz, SW₂ de, color VR max

I SW3 → ON, SW6 → k, I
 II SW3 → OFF, SW6 → m, n

Note:28 $V_{04} - V_{04}/4 - V_{04}$

where V_{04} , V_{04} , V_{04} are output voltages at supply voltage 10, 12, 14V.

Note:29 Topg-20 ~ +65°C.

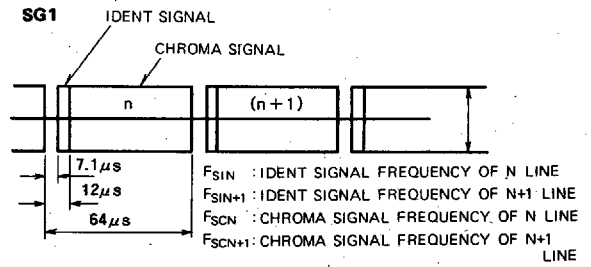
Note:30 Output level (after eliminating SYNC pulse) at input Signal 2 V_{PP} . $f=4.3\text{MHz}$

Note:31 I (Crosstalk SECAM → PAL) Input Signal at ②
 100mV_{PP}, $f=4.3\text{MHz}$, without SYNC pulse

II (Crosstalk PAL → SECAM) Input Signal at ③
 2V_{PP}, $f=4.3\text{MHz}$, SW3 → ON, SW5 → ON without SYNC pulse

Note:32 Change of output voltage via supply voltage 10, 12, 14 volts (mV/V).

INPUT SIGNAL



REFERENCE LEVEL 0dB : $e_c = 100\text{mV}_{PP}$

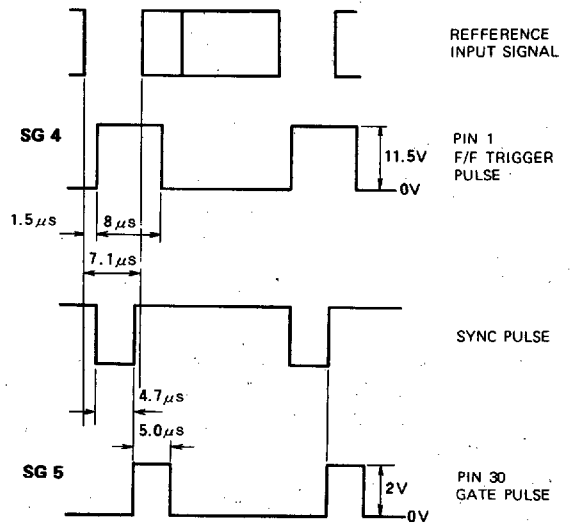
FREQUENCY OF SG1

| Symbol | n line | n+1 line |
|----------|-----------|----------|
| f_{s1} | 4.250 | 4.406 |
| f_{sc} | $W = f_0$ | 4.250 |
| | Y | 4.020 |
| | CY | 4.3276 |
| | G | 4.0976 |
| | MG | 4.4024 |
| | R | 4.1724 |
| | B | 4.480 |
| | BK | 4.250 |

SG2 4.3 ± 0.5 MHz SINE WAVE

SG3 100K ~ 2 MHz SINE WAVE

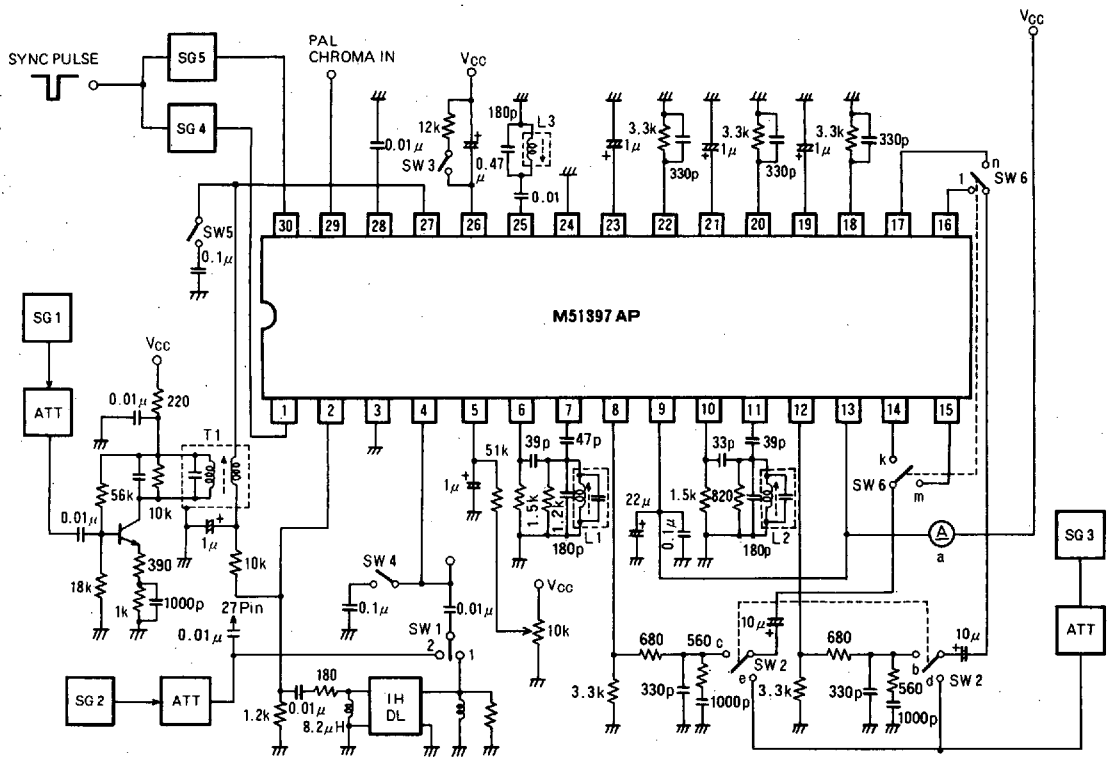
Gate Pulse & F/F Trg. Pulse



M51397AP

SECAM CHROMA SYSTEM

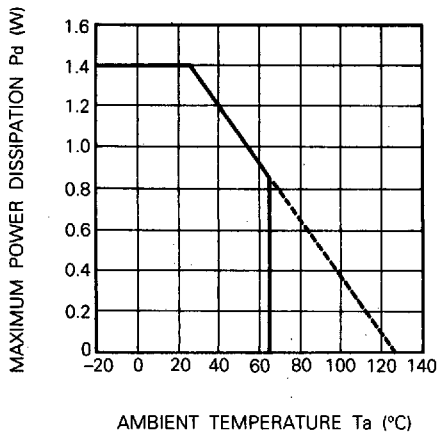
TEST CIRCUIT



Units Resistance: Ω
Capacitance: F

TYPICAL CHARACTERISTICS

THERMAL DERATING (MAXIMUM RATING)



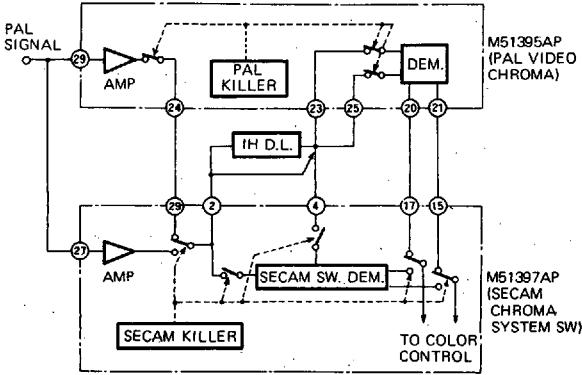
M51397AP

SECAM CHROMA SYSTEM

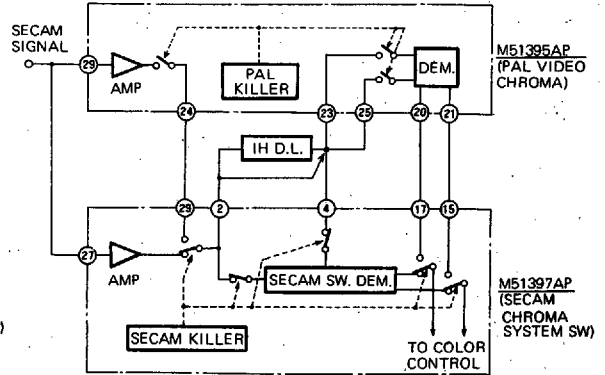
APPLICATION EXAMPLE OF M51395AP, M51397AP FOR PAL SECAM DUAL SYSTEM

MODE OF SYSTEM SW

(a) Mode at PAL signal input

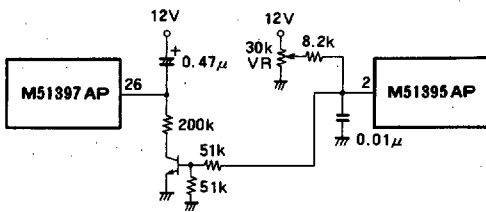


(b) Mode at SECAM signal input

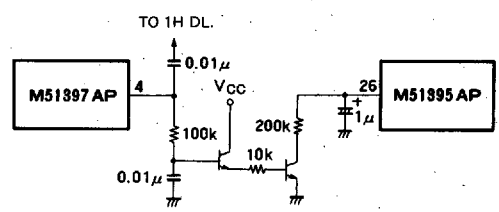


APPLICATION EXAMPLE FOR CONTROL OF THE PRIORITY OF THE DUAL MODE

(a) Mode at PAL signal input



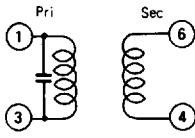
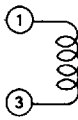
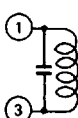
(b) Mode at SECAM signal input



M51395AP (When the M51395AP is applied for PAL and SECAM dual system color TV)

| Parts | Specification |
|---|--|
| Coil For D.L. CCT | <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Pri</p> </div> <div style="text-align: center;"> <p>Sec</p> </div> </div> <p>① ~ ② 16 Turns ② ~ ③ 16 Turns ④ ~ ⑤ 16 Turns ⑤ ~ ⑥ 16 Turns</p> <p>Bobbin: 10K type Pot Core: CT-31 Screw Core: C-2 Wire: 0.09φ 2UEW no load Q: 40</p> |
| Burst Cleaning and CW Phase Shift | <p>① ~ ③ 18 Turns</p> <p>Capacitor: 82PF RH type</p> <p>Bobbin: 10K type Pot Core: CT-31 Screw Core: C-2 Wire: 0.09φ 2UEW no load Q: 56</p> |
| D.L. | Type No. ADL-CS11 mfd by ASAHI GLASS CORP. JAPAN |
| X'tal | Type no. A9M2 mfd by Kinsekisha, Japan Load C: 16pF |

M51397AP

| Parts | Specification | |
|-------------|---|--|
| Bell Filter |  | <p>① - ③ 32 Turns ④ - ⑥ 8 Turns Capacitor : 82PF RH type</p> <p>Bobbin : 10K type Pot Core : CT-31 Screw Core : C-2 Wire : 0.1φ 2UEW no load Q : 36</p> |
| Ident Coil |  | <p>① - ③ 10 Turns with 2 wires (parallel)</p> <p>Bobbin : 10K type Pot Core : CT-31 Screw Core : C-2 Wire : 0.1φ 2UEW no load Q : 59</p> |
| Demo Coil |  | <p>① - ③ 18 Turns</p> <p>Capacitor : 82PF RH type</p> <p>Bobbin : 10K type Pot Core : CT-31 Screw Core : C-2 Wire : 0.1φ 2UEW no load Q : 55</p> |
| D.L. | The D.L. of M51395AP is applied commonly. | |

A pot core and a screw core are manufactured by Taiyo Yuden, Japan.

Adjustment of electrical characteristic for PAL/SECAM dual system circuit M51395AP/M51397AP.

Adjustment is achieved as following sequence.

1. Bell filter transformer "T₁" (M51397AP)
 Apply SECAM color signal to the input.
 Adjust bell filter transformer "T₁" to make the color signal envelope at test point "TP₂" into flat.
2. Ident discriminator coil "L₁" (M51397AP)
 Adjust ident discriminator coil "L₁" to give maximum ident filter voltage value at test point "TP₁".
3. Discriminator (Demodulator) coil "T₃/T₄" (M51397AP)
 Adjust discriminator coil "T₃/T₄" to make the voltage of no color signal equal to the clamp voltage (~7.2V) at pins 18 and 22.
4. 4.433619MHz free run frequency (M51395AP)
 Apply PAL B/W signal (no burst) to input, and connect 0.01μF between pin 1 and GND.

Connect high input impedance frequency counter at pin 17.

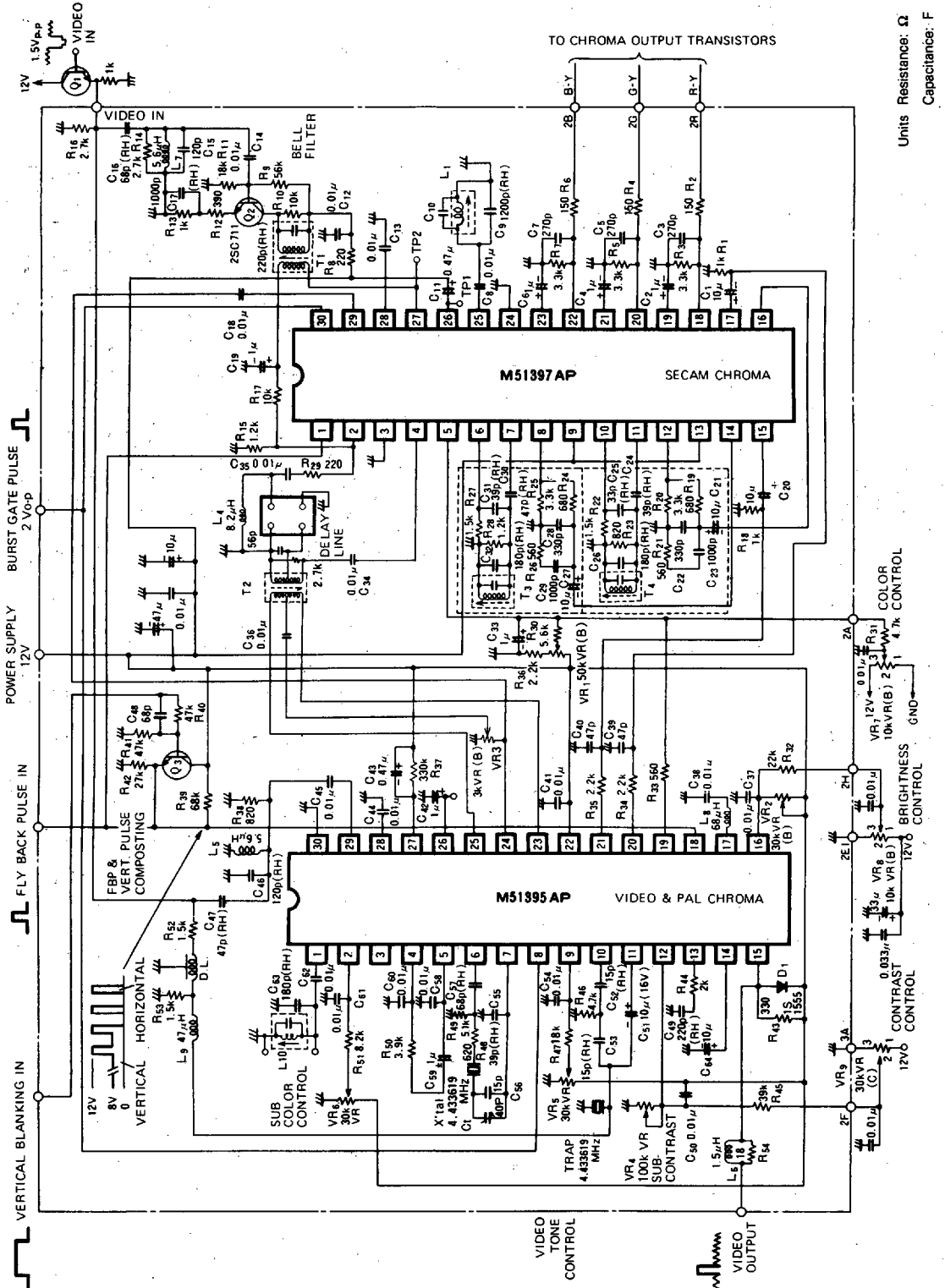
Adjust the trimmer capacitor "C_t" to frequency 4.433619MHz.

5. Burst cleaning coil "L₁₀" (M51395AP)
 Apply PAL color signal to input.
 Adjust burst cleaning coil "L₁₀" to give minimum chroma output signal value at pin 24.
6. Delay line transformer "T₂", chroma difference signal control "VR₃" (M51395AP)
 Adjust delay line transformer "T₂" and chroma difference signal control "VR₃" to correct demodulated ratios at pins 18, 20 and 22. If demodulated ratios are not correct, readjust burst cleaning coil "L₁₀".

M51397AP

SECAM CHROMA SYSTEM

APPLICATION EXAMPLE



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