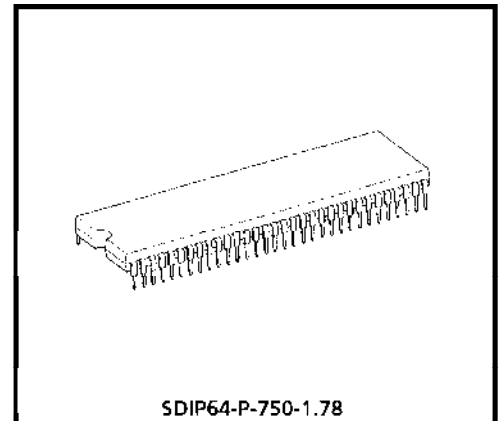


TA8880CN

VIDEO, CHROMA, AND SYNC. SIGNAL PROCESSING IC FOR PAL / NTSC / SECAM-SYSTEM COLOR TELEVISIONS

The TA8880CN is a signal processing IC for a PAL / NTSC / SECAM-system color television involving video, chroma, and sync. signal processing circuits in a 64-pin shrink DIP plastic package.

The video section contains a high-performance picture quality emphasis circuit, the chroma section contains a PAL / NTSC / SECAM-system automatic identification circuit, and the sync. section contains a 50 / 60Hz automatic identification circuit. The PAL / SECAM demodulating circuit uses a baseband signal processing system, providing an adjustment-free demodulating circuit. User control functions, system switching, etc. are controlled via the I²C bus.



Weight : 8.85g (Typ.)

FEATURES

Video section

- Sharpness control with internal delay lines
- Black stretching circuit
- YNR
- Variable DC restoration ratio
- Gamma (γ) contrast correction

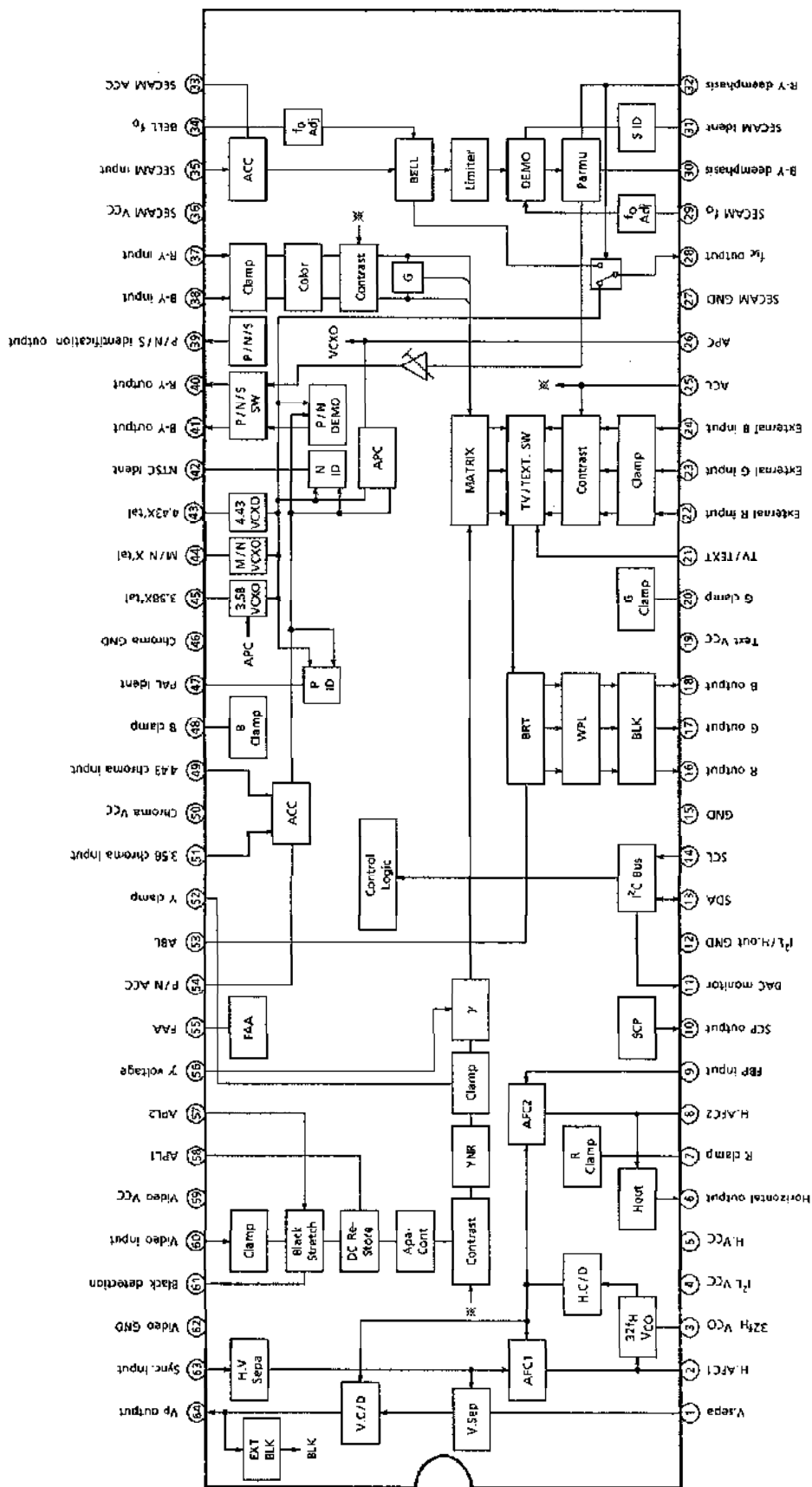
Chroma section

- PAL / SECAM baseband demodulation system
- Automatic crystal frequency identification (4.43MHz / 3.58MHz / M, N-PAL)
- Automatic chroma system identification (PAL / NTSC / SECAM)
- PLL SECAM adjustment-free demodulating circuit without any tank coils
- Built-in SECAM BELL filter

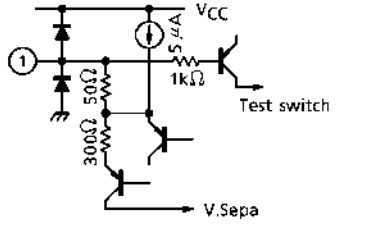
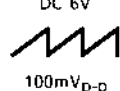
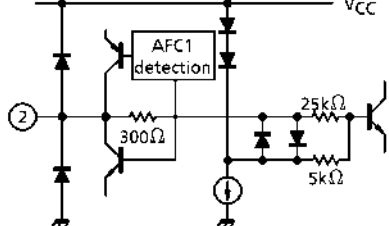
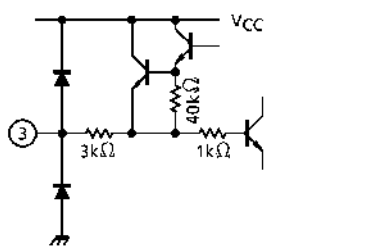
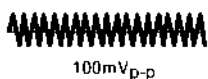
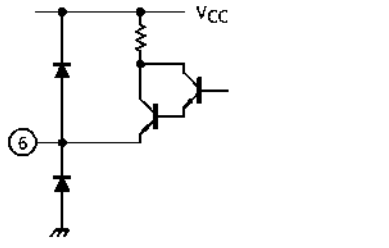

Sync. section

- Adjustment-free horizontal and vertical oscillation circuits based on countdown system
- Automatic vertical frequency identification (50 / 60Hz)3

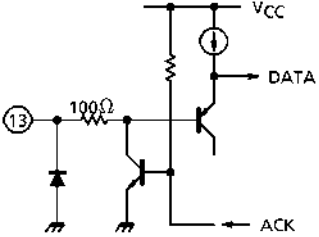
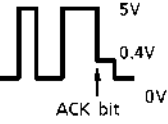
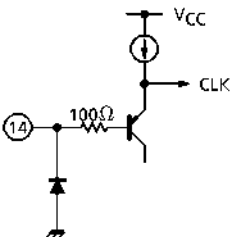

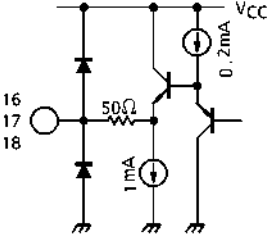
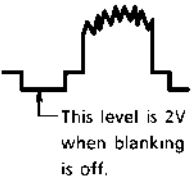
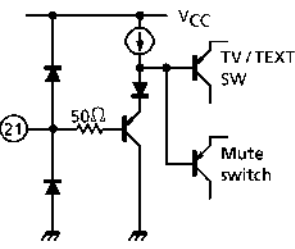
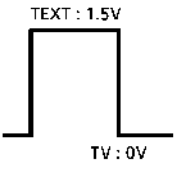
BLOCK DIAGRAM



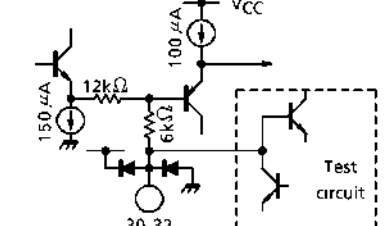
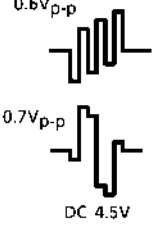
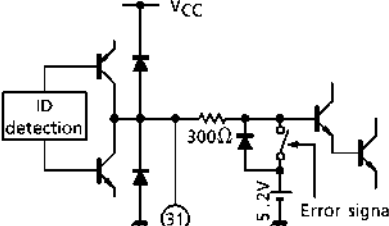
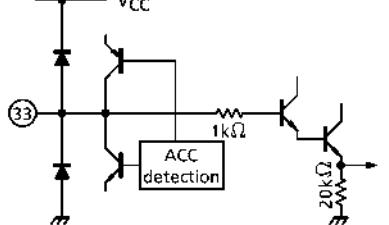
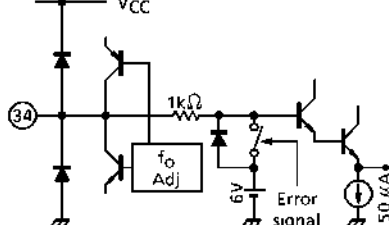
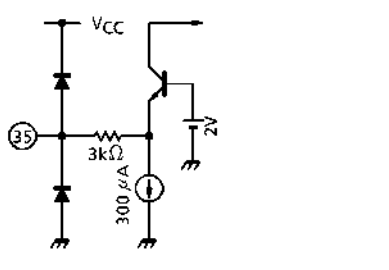
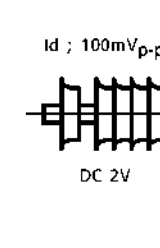
TERMINAL FUNCTION

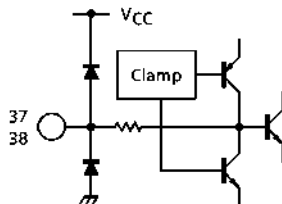
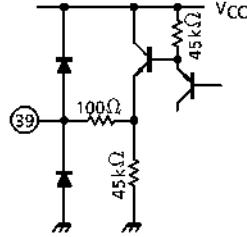
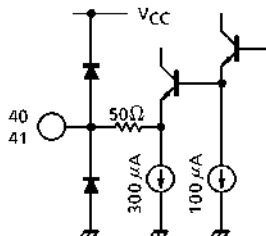
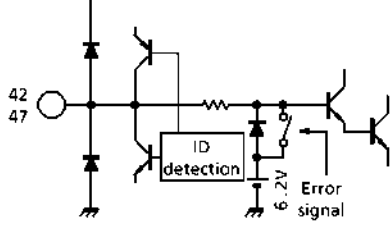
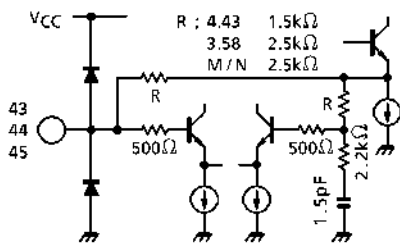
| PIN No. | PIN NAME | FUNCTION | INTERFACE CIRCUIT | TERMINAL SIGNAL |
|---------|----------------------------------|---|--|---|
| 1 | V.Sepa | This pin is for a vertical sync. signal separation filter. |  | <p>DC 6V</p>  <p>100mV_{p-p}</p> |
| 2 | H.AFC1 | This pin is for a horizontal AFC filter. The voltage at this pin determines the frequency of horizontal output. |  | <p>DC 7.6V</p> |
| 3 | 32f _H V _{CO} | This pin is for a ceramic resonator for horizontal oscillation. For this resonator, we recommend the CSB503F30 made by MURATA ELECTRONICS Co. |  | <p>DC 6V</p>  <p>100mV_{p-p}</p> |
| 4 | I ² L V _{CC} | This is the power supply for the logic processing circuit. Apply 3.3V (typ.) to this pin. | — | — |
| 5 | H.V _{CC} | This is the power supply for the horizontal sync. circuit. Apply 9V (typ.) to this pin. | — | — |
| 6 | Horizontal output | This is a horizontal output terminal. |  | <p>High : 5V Low : 0V</p>  <p>Duty cycle : 41%</p> |

| PIN No. | PIN NAME | FUNCTION | INTERFACE CIRCUIT | TERMINAL SIGNAL |
|---------------|-------------------------------|--|-------------------|-----------------|
| 7 20 48 | R clamp G clamp B clamp | These pins are for the R, G, and B output clamping filters. | | DC 3.5V~4.5V |
| 8 | H.AFC2 | This pin is for a H.AFC2 filter. The voltage at this pin determines the phase of the horizontal output. | | DC 7V |
| 9 | FBP input | This pin is input terminal for FBP to generate pulses for H.AFC2 and horizontal blanking circuits. | | |
| 10 | SCP output | This pin outputs a Sand Castle Pulse (SCP). The output signal consists of a clamp pulse, horizontal blanking, and vertical blanking. Use 10kΩ for load resistance. | | |
| 11 | DAC monitor | (1) Selects a slave address. High : 8AH Low : 88H (2) Can monitor the output voltage of each control DAC. (3) Color control terminal. | | DC 3V |
| 12 | I ² L/H.out GND | This is the ground for the logic and horizontal output circuits. | — | — |

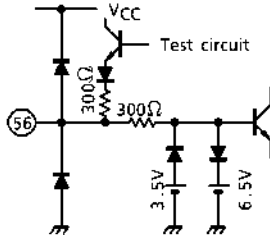
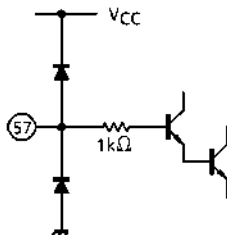
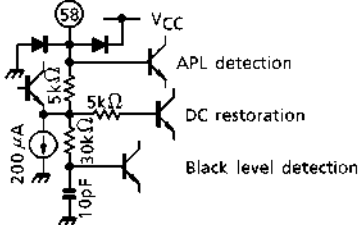

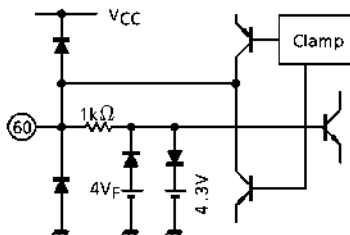
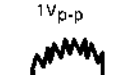
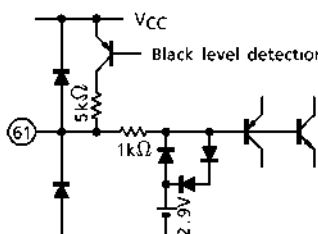
| PIN No. | PIN NAME | FUNCTION | INTERFACE CIRCUIT | TERMINAL SIGNAL | | | | | | |
|----------------|----------------------------------|--|---|---|----|------|----|----|--|---|
| 13 | SDA | This is a SDA terminal for the I ² C bus. Because its is week for surge impulse, connect external devices for protection against surge if necessary. |  |  | | | | | | |
| 14 | SCL | This is a SCL terminal for the I ² C bus. Because its is week for surge impulse, connect external devices for protection against surge if necessary. |  |  | | | | | | |
| 15 | GND | This is the ground for the sync. and TEXT circuits. | — | — | | | | | | |
| 16 17 18 | R output G output B output | These pins are R, G, and B outputs. When using this device in combination with the TA8889P or TA8889AP, turn its blanking mode off. |  |  | | | | | | |
| 19 | TEXT V _{CC} | This is the power supply for the TEXT circuit. Apply 9V (typ.) to this pin. | — | — | | | | | | |
| 21 | TV/TEXT | This pin is a switch selecting the R/G/B output signal between TV signal and external TEXT signal. This pin also is a R/G/B mute switch. V _{th} : <table border="0" style="display: inline-table; vertical-align: middle;"> <tr><td>5V</td><td>Mute</td></tr> <tr><td>1V</td><td>TEXT</td></tr> <tr><td>0V</td><td>TV</td></tr> </table> | 5V | Mute | 1V | TEXT | 0V | TV |  |  |
| 5V | Mute | | | | | | | | | |
| 1V | TEXT | | | | | | | | | |
| 0V | TV | | | | | | | | | |

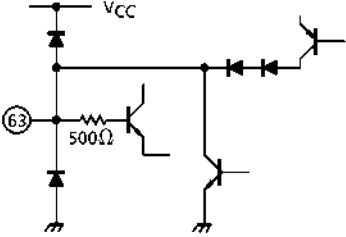
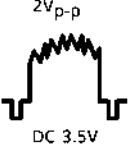
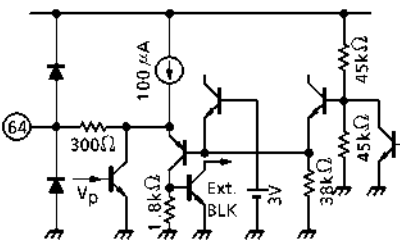
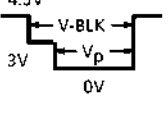
| PIN No. | PIN NAME | FUNCTION | INTERFACE CIRCUIT | TERMINAL SIGNAL |
|----------------|--|--|-------------------|--|
| 22 23 24 | External R input External G input External B input | These are external TEXT input pins. Input R / G / B signal through a clamping capacitor. | | <p>0.4V_{p-p}</p> <p>DC 3.8V</p> |
| 25 | ACL | This is an external unicolor control terminal. Use this pin when applying ACL. | | <p>DC 2V</p> |
| 26 | APC | This pin is for an APC filter for PAL/NTSC demodulation. The voltage at this pin determines the oscillation frequency of VCXO. | | <p>DC 6.2V</p> |
| 27 | SECAM GND | This is the ground for the SECAM demodulator circuit. | — | — |
| 28 | f _{sc} output | (1) Outputs the oscillation waveform of VCXO. (2) Outputs the signal through the BELL filter if applying 1V to pin 32. | | <p>(1) 4MHz 3MHz</p> <p>(2) BELL</p> |
| 29 | SECAM f _o | Connect automatic f _o adjusting filter for SECAM PLL demodulation VCO. | | <p>DC 7.6V</p> |

| PIN No. | PIN NAME | FUNCTION | INTERFACE CIRCUIT | TERMINAL SIGNAL |
|----------|----------------------------------|--|--|--|
| 30 32 | B-Y deemphasis R-Y deemphasis | This pin is for a SECAM deemphasis capacitor. The output of the BELL filter can be monitored at pin 28 by applying 1V to pin 32. |  |  <p>0.6V_{p-p} 0.7V_{p-p} DC 4.5V</p> |
| 31 | SECAM Ident | This pin is for a SECAM Ident filter. Connect a proper value resistance in parallel to prevent mis-identification of color system. |  | DC 5.2V |
| 33 | SECAM ACC | This pin is for a SECAM ACC filter. |  | DC 4V |
| 34 | BELL f ₀ | This pin is for an automatic f ₀ adjusting filter for the BELL filter. |  | DC 6V |
| 35 | SECAM input | This pin is for the SECAM chroma signal input. Input the chroma signal through a broadband 4.3MHz BPF to improve the color signal edge shape on the condition of small signal input. |  |  <p>Id ; 100mV_{p-p} DC 2V</p> |
| 36 | SECAM V _{CC} | This is the power supply for the SECAM demodulator circuit. | — | — |

| PIN No. | PIN NAME | FUNCTION | INTERFACE CIRCUIT | TERMINAL SIGNAL |
|----------------|-------------------------------------|--|--|---|
| 37 38 | R-Y input B-Y input | These are input terminals for R-Y and B-Y signals. Input R-Y and B-Y signals through a clamping capacitor. |  | 0.7V _{p-p} 0.6V _{p-p} DC 4.5V |
| 39 | P/N/S identification output | This pin shows the system identification, PAL, SECAM or NTSC. For the black and white identification, this pin keeps the immediate voltage. The voltage at this pin immediately after power-on is indeterminate. |  | DC PAL 8.3V SECAM 4.6V NTSC 0V |
| 40 41 | R-Y output B-Y output | These pins output the R-Y and B-Y signals. |  | 0.7V _{p-p} 0.6V _{p-p} DC 3.3V |
| 42 47 | NTSC Ident PAL Ident | This pin is for a PAL/NTSC Ident filter. The color killer sensitivity can be set by connecting resistance in parallel to prevent mis-identification. |  | DC 6.2V |
| 43 44 45 | 4.43X'tal M/N X'tal 3.58X'tal | These pins are for crystal resonators. Use the series capacitance to vary the free running frequency, f_0 , and the parallel capacitance to vary the frequency control range. |  | DC 5.7V 150mV _{p-p} |
| 46 | Chroma GND | This is the ground for the PAL/NTSC demodulator circuit. | — | — |

| PIN No. | PIN NAME | FUNCTION | INTERFACE CIRCUIT | TERMINAL SIGNAL |
|----------|--|---|-------------------|-----------------|
| 49 51 | 4.43 chroma input 3.58 chroma input | These pins are the 4.43 / 3.58MHz chroma signal inputs. Input the chroma signal through a BPF. | | |
| 50 | Chroma VCC | This is the power supply for the PAL/NTSC demodulator circuit. Apply 9V (typ.) to this pin. | — | — |
| 52 | Y clamp | This pin is for a clamp filter for the video signal circuit. | | DC 2V |
| 53 | ABL | This is an external brightness control terminal. Use this pin when applying ABL. | | DC 2V |
| 54 | ACC | This pin is for a PAL/NTSC ACC filter. | | DC 5.8V |
| 55 | FAA | This pin is for a filter of automatic f ₀ adjustment circuit for the built-in filters. The voltage at this filter determines the sharpness peak frequency, BELL center frequency and SECAM demodulation center frequency. | | DC 4.5V |

| PIN No. | PIN NAME | FUNCTION | INTERFACE CIRCUIT | TERMINAL SIGNAL |
|---------|----------------------------|---|--|--|
| 56 | Gamma (γ) voltage | The voltage at this pin determines the starting point of γ compensation for the video signal. This is also a test pin. |  | DC 5V |
| 57 | APL2 | The voltage at this pin determines the starting point of black stretching. |  | DC 3.2V |
| 58 | APL1 | This pin is for a filter to determine the DC restoration ratio. The black-stretched video signal is appeared at this pin. |  | 0.7V _{p-p}  DC 2.9V |
| 59 | Video VCC | This is the power supply for the video circuit. Apply 9V (typ.) to this pin. | — | — |
| 60 | Video input | This pin is the video signal input. Input the video signal through a clamping capacitor. |  | 1V _{p-p}  DC 2.9V |
| 61 | Black detection | This pin is for a filter to detect the black level of video signal. The voltage at this pin determines the black stretching gain. |  | DC 2.9V |

| PIN No. | PIN NAME | FUNCTION | INTERFACE CIRCUIT | TERMINAL SIGNAL |
|---------|-----------------------|---|--|---|
| 62 | Video GND | This is the ground for the video circuit. | — | — |
| 63 | Sync. input | This pin is input for the sync. separation circuit. Input the sync. signal through a clamping capacitor. |  |  |
| 64 | V _p output | This is a vertical pulse output terminal. This pin is also an external vertical blanking input. Blanking is applied after being OR'ed with the internal blanking. |  |  |

TERMINAL SIGNAL : Standard input/output signals under normal operation.

BUS CONTROL MAP

Write data (Standard slave address 88H)

| SUB ADDRESS | MSB 7 | 6 | 5 | 4 | 3 | 2 | 1 | LSB 0 | INITIAL VALUE AT POWER-ON | |
|-------------|----------------------------------|-----------------------------|---------------------------------------|----------------------------------|---------------------|------|------|-------|---------------------------|------|
| | | | | | | | | | MSB | LSB |
| 00 | WPL | Color | | | | | | | 0100 | 0000 |
| 01 | Sharpness SW | TINT (for NTSC only) | | | | | | | 0100 | 0000 |
| 02 | | Brightness | | | | | | | 0100 | 0000 |
| 03 | P/N GP | Unicolor | | | | | | | 0100 | 0000 |
| 04 | Vertical mode | Sharpness | | | | | | | 0010 | 0000 |
| 05 | Vertical phase adjustment | Horizontal phase adjustment | | | | | | | 0001 | 0000 |
| 06 | Mute mode | BLK | B/W | X'tal mode | Color system | | | | 0100 | 0000 |
| 07 | P/N amplitude | SECAM amplitude | BELL filter f ₀ adjustment | | | S GP | S ID | 0001 | 0000 | |
| 08 | SECAM black level adjustment R-Y | | | SECAM black level adjustment B-Y | | | | | 1000 | 1000 |
| 09 | Search | Blue back | YNR | AFC | Test mode selection | | | | 0000 | 0000 |

Read data (Standard slave address 89H)

| | | | | | |
|--|--------|--------------|------------|------------|----------|
| | PONRES | Color system | X'tal mode | Vertical F | Reserved |
|--|--------|--------------|------------|------------|----------|

BUS CONTROL FUNCTIONS

- Write function (★ : Initial value at power-on)

Color, TINT, brightness, unicolor, sharpness

User control.

For color, TINT, and unicolor, It is recommended to use 100LSB in 128LSB for user control and 28LSB for subcontrol.

Vertical phase adjustment

Fine adjust the screen position in the vertical direction. (The variable range is approximately 1.3% of the screen size.)

Horizontal phase adjustment

Fine adjust the screen position in the horizontal direction. (The variable range is approximately 7.8% of the screen size.)

P/N amplitude, SECAM amplitude

Adjust these amplitudes if there is any difference in color-difference signal amplitude between PAL/NTSC and SECAM.

BELL filter f_0

Fine adjust the internal BELL filter's f_0 . Q is fixed.

SECAM black level adjustment

Adjust the black level (blanking level) of the SECAM color-difference signal.

| | |
|---------------|--|
| WPL | ★ 0 : WPL (White Peak Limiter) on 1 : WPL off |
| Sharpness | ★ 0 : Sharpness function on |
| SW | 1 : Sharpness function off |
| P/N GP | ★ 0 : PAL/NTSC gate pulse position, initial value 1 : 0.5 μ s delay |
| Vertical mode | ★ 00 : Vertical frequency automatically identification (312.5H/262.5H) 01 : Reserved (operates in the same way as for 00; V separation level is not sensitive.) 10 : Fixed to 312.5H (without vertical sync pull-in function) 11 : Fixed to 262.5H (without vertical sync pull-in function) |
| Mute mode | 00 : Mute off ★ 01 : RGB muted, RGB output voltage 2V (trace period) 10 : Y signal muted (used for adjusting NTSC TINT center) 11 : Y/C muted, V_p output stop, brightness control possible |
| BLK | ★ 0 : Blanking on 1 : Blanking off |
| B/W | ★ 0 : Color killer is available 1 : Forced monochrome mode |
| X'tal mode | ★ 00 : Crystal resonator frequency automatic identification mode 01 : 4.43MHz fixed mode 10 : 3.58MHz fixed mode 11 : M/N crystal fixed mode |

| | |
|-----------------|---|
| Color system | ★ 00 : Color system automatic identification mode 01 : Color killer operating with PAL ident only 10 : Color killer operating with NTSC ident only 11 : Color killer operating with SECAM ident only |
| S GP | ★ 0 : SECAM gate pulse position, initial value 1 : $-0.5\mu s$ |
| S ID | ★ 0 : SECAM identification depends on only H ident signal 1 : SECAM identification depends on only H and V ident signal |
| Search | ★ 0 : X'tal identification period is 4 vertical period 1 : X'tal identification period is 8 vertical period |
| Blue back | ★ 00 : Blue back off 01 : All white 10 : All red 11 : Blue back on |
| YNR | ★ 0 : YNR off 1 : YNR on |
| AFC | ★ 0 : AFC detection current $350\mu A$ 1 : AFC detection current $700\mu A$ |
| ● Read function | |
| PONRES | 0 : Read data at the second and following read timing after power-on 1 : Read data at the first read timing after power-on |
| Color system | 00 : Monochrome 01 : PAL 10 : NTSC 11 : SECAM |
| X'tal mode | 01 : 4.43MHz X'tal 10 : 3.58MHz X'tal 11 : M/N X'tal |
| Vertical F | 0 : Vertical 50Hz 1 : Vertical 60Hz |

COLOR SYSTEM AUTOMATIC IDENTIFICATION MODE SWITCH

Color system automatic identification mode, 4PAL/4NTSC/3NTSC/MN-PAL or 4PAL/4NTSC/3NTSC/SECAM, can be selected. Connecting pin 44 to GND with $2.4k\Omega$ selects the automatic identification mode for 4PAL/4NTSC/3NTSC/SECAM.

4PAL : 4.43MHz PAL
4NTSC : 4.43MHz NTSC
3NTSC : 3.58MHz NTSC

DATA TRANSFER FORMAT VIA I²C BUS

Slave address : Voltage at pin 11 determines the slave address.

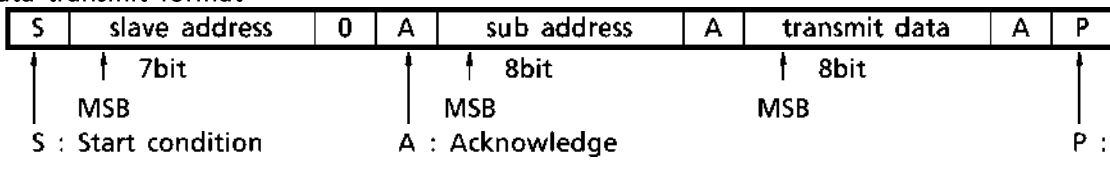
If the voltage is less than 5V

| | | | | | | | |
|----|----|----|----|----|----|----|-----|
| A6 | A5 | A4 | A3 | A2 | A1 | A0 | W/R |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0/1 |

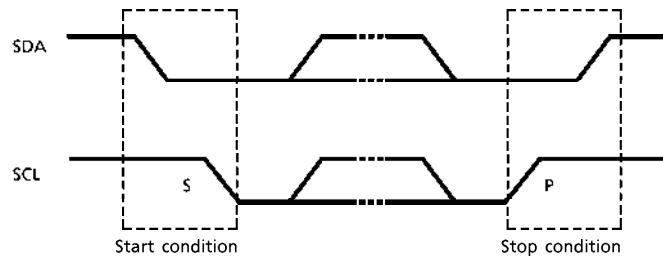
If the voltage is more than 5V

| | | | | | | | |
|----|----|----|----|----|----|----|-----|
| A6 | A5 | A4 | A3 | A2 | A1 | A0 | W/R |
| 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0/1 |

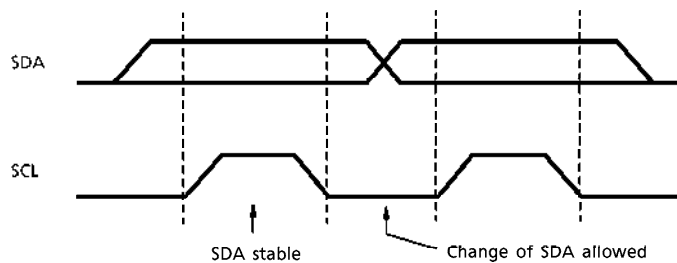
Data transmit format



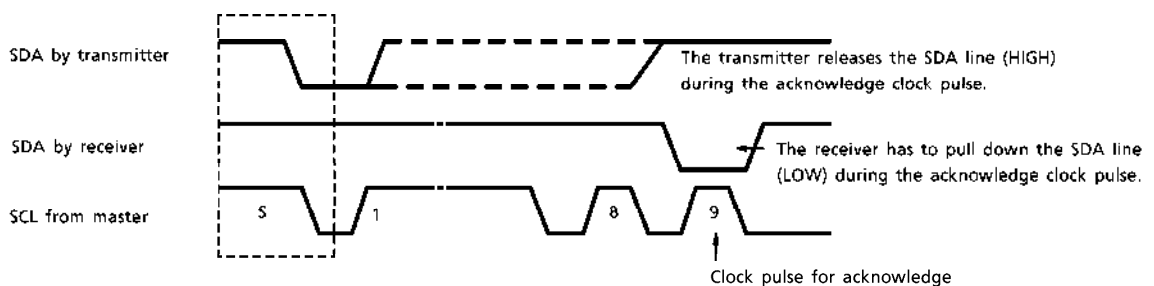
Start and stop conditions



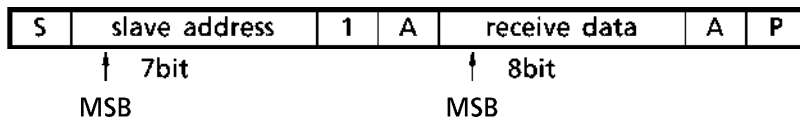
Bit transfer



Acknowledge



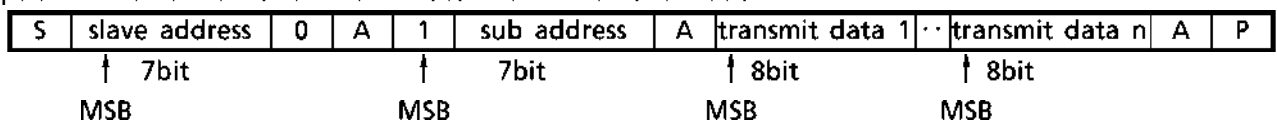
Data receive format



At the moment of the first acknowledge, the master transmitter becomes a master receiver and the slave receiver becomes a slave transmitter. This acknowledge is still generated by the slave.

The STOP condition is generated by the master.

Optional data transmit format : Automatic increment mode



In this transmission method, data is set on automatically incremented sub-address from the specified sub-address.

Purchase of TOSHIBA I²C components conveys a license under the Philips I²C Patent Rights to use these components in an I²C system, provided that the system conforms to the I²C Standard Specification as defined by Philips.

SPECIAL FUNCTION SWITCH (used to test the device before shipping)

DAC monitor

The voltages of the internal DACs can be monitored at pin 11.

Test mode selection

- ★ 000 : On the condition that voltage at pin 11 is lower than 5V, the slave address is 88H and external color control is available.
On the condition that voltage at pin 11 is higher than 5V, the slave address is 8AH.
- 001 : Color DAC
- 010 : TINT DAC
- 011 : Sharpness DAC
- 100 : Horizontal phase adjustment DAC
- 101 : BELL filter f_0 adjustment DAC

The voltages of the SECAM adjustment DACs can be monitored on pin 30 and pin 32.

Test mode selection

- 110 : SECAM amplitude adjustment DAC
- 111 : SECAM black level adjustment DAC

Internal pulses monitor of sync.

Some internal pulses in the sync. section can be monitored by applying the designated voltage to pin 1 as shown below.

| PULSE NAME | APPLIED VOLTAGE (V) | | | MONITOR PIN |
|------------|---------------------|-------|-------------------|----------------|
| | 0~1.5 | 1.5~3 | 3~V _{CC} | |
| PN GP | OFF | ON | OFF | 64 |
| Video GP | ON | OFF | OFF | |

RGB blanking stops in this test mode.

AFC1 mask stop mode

The AFC1 masking operation can be disabled by connecting pin 1 to GND.

Internal signal monitor in SECAM demodulating section

Internal signals in the SECAM demodulating section can be monitored as shown below.

| CONDITION NAME OF INTERNAL SIGNAL | VOLTAGES APPLIED TO PIN30 | | | | OUTPUT PIN |
|--------------------------------------|---------------------------|---------|---------------------|------|------------|
| | 0~2 | 5.6~6.5 | 6.5~V _{CC} | OPEN | |
| f ₀ adj. pulse | ON | OFF | OFF | OFF | 32 |
| ACC key pulse | OFF | ON | OFF | OFF | |
| ID key pulse | OFF | OFF | ON | OFF | |

| CONDITION NAME OF INTERNAL SIGNAL | VOLTAGES APPLIED TO PIN32 | | | | OUTPUT PIN |
|--------------------------------------|---------------------------|-----|-------------------|------|------------|
| | 0~2 | 7~8 | 8~V _{CC} | OPEN | |
| Permu. stop | OFF | ON | OFF | OFF | 30 |
| All time f ₀ adj. | OFF | OFF | ON | OFF | |
| Bell monitor | ON | OFF | OFF | OFF | 28 |

Video section delay line monitor

The characteristics of the internal delay line that is used for sharpness in the video section can be monitored. The characteristics of the internal delay line can be monitored at pin 56 as a trap frequency response.

| CONDITION INTERNAL SIGNAL | VOLTAGE APPLIED TO PIN53 | OUTPUT PIN |
|------------------------------|--------------------------|------------|
| DL Trap | higher than 5.5 V | 56 |

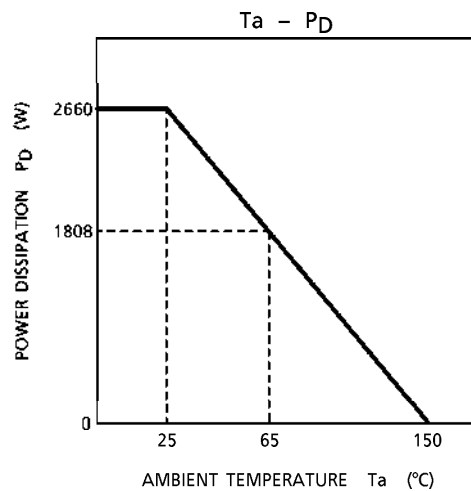
When monitoring, connect pin 56 to GND with 5.1kΩ.

MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|------------------------|--------------------|---------------------------------|------------------|
| Supply Voltage | V _{CC} | 15 | V |
| Power Dissipation | P _{Dmax.} | 2660 (Note 1) | mW |
| Input Signal Amplitude | e _{in} | 5 | V _{p-p} |
| Applied Voltage | E _{in} | GND - 0.3~V _{CC} + 0.3 | V |
| Operating Temperature | T _{opr} | - 20~65 | °C |
| Storage Temperature | T _{stg} | - 55~150 | °C |

(Note 1) When using the device at above Ta = 25°C, decrease the power dissipation by 21.2mW for each increase of 1°C.

(Note 2) Pin 13 and pin 14 are weak against static electricity and surge impulse. If necessary, please take counter measure to meet.



RECOMMENDED OPERATING CONDITION

| CHARACTERISTIC | CONDITION | MIN. | TYP. | MAX. | UNIT |
|-------------------------------|--------------------------------------|------|------|------|-------------------|
| Supply Voltage | At pin 19, pin 36, pin 50 and pin 59 | 8.1 | 9.0 | 9.5 | V |
| | At pin 5 | 8.1 | 9.0 | 10.0 | |
| | At pin 4 | 3.0 | 3.3 | 3.6 | |
| Video Input Signal Level | Composite video signal amplitude | 0.7 | 1.0 | 1.2 | V _{p-p} |
| Chroma Input Signal Level | PAL/NTSC chroma input | 100 | 200 | 300 | mV _{p-p} |
| | SECAM chroma input | 50 | 100 | 150 | |
| Sync Input Signal Level | Composite video signal amplitude | 1.0 | 2.0 | 2.5 | V _{p-p} |
| Text Input Signal Level | — | 0.5 | 0.7 | 1.0 | V _{p-p} |
| FBP Width | — | 11 | 12 | 13 | μs |
| FBP Input Current | — | 0.3 | 1.0 | 1.3 | mA |
| RGB Output Current | — | — | 1.0 | 2.0 | mA |
| H.out Output Current | — | — | 3.0 | 5.0 | mA |
| V _p Output Current | — | — | 1.0 | 2.0 | mA |

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, $V_{CC} = 9V$, logic $V_{CC} = 3.3V$, and $T_a = 25^\circ C$, the data of each sub-address is the device's switch-on default values except the following :
Sub-address 06H : data 00H)

DC CHARACTERISTICS

| CHARACTERISTIC | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|------------------|---------------|--|------|------|------|------|
| Supply Current | 1 | Logic V_{CC} (pin 4) 3.3V | 10 | 20 | 28 | mA |
| | 1 | Video/chroma V_{CC} turned off | 15 | 30 | 40 | |
| | 1 | H. V_{CC} (pin 5) 9V | 10 | 20 | 28 | |
| | 1 | Video/chroma V_{CC} turned off | 15 | 30 | 40 | |
| | 1 | TEXT section V_{CC} (pin 19) 9V | 15 | 31 | 44 | |
| | 1 | SECAM section V_{CC} (pin 36) 9V | 10 | 18 | 25 | |
| | 1 | Chroma section V_{CC} (pin 50) 9V | 12 | 27 | 38 | |
| | 1 | Video section V_{CC} (pin 59) 9V | 17 | 37 | 52 | |
| Terminal Voltage | 1 | Pin 2 | 7.2 | 7.4 | 7.8 | V |
| | 1 | Pin 16, pin 17 and pin 18 (In mute mode) | 1.7 | 2.0 | 2.3 | |
| | 1 | Pin 22, pin 23 and pin 24 (Unicolor dac center) | 3.3 | 3.8 | 4.2 | |
| | 1 | Pin 63 (Apply 5V with 5.1k Ω resistor, measure DC output voltage at trace period.) | 3.1 | 3.5 | 3.9 | |

AC CHARACTERISTICS

Video section

| CHARACTERISTIC | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT | |
|-----------------------------------|---------------|---|--|------|------|------------|-----------|
| Y Input Dynamic Range | Upper | 1 | Measure dynamic range above the pedestal level | 0.7 | 1.0 | 1.3 | V_{p-p} |
| | Lower | | | | | | |
| Y Input Impedance | 1 | Measure input impedance of pin 60 | 100 | 130 | — | k Ω | |
| Y Input Clamp Voltage | 1 | Measure DC voltage at pin 60 when Y input connected to AC GND | 2.5 | 2.8 | 3.1 | V | |
| Maximum Y Gain | 1 | Note 1 | 15 | 17.5 | 23 | dB | |
| Y Frequency Bandwidth | 1 | Note 2 | 8 | 10 | 15 | MHz | |
| Black Stretching Amp Maximum Gain | 1 | Note 3 | 1.3 | 1.4 | 1.5 | — | |
| Black Stretching Start Point | 1 | Note 4 | 40 | 50 | 65 | IRE | |
| DC Restoration Ratio | 1 | Note 5 | 97 | 100 | 103 | % | |
| Black Stretching Start Voltage | 1 | Note 6 | 3.2 | 3.3 | 3.6 | V | |
| Delay Time Of Sharpness Circuit | 1 | Measure difference in Y output signal delay time between sharpness SW turned on and off | 115 | 125 | 135 | ns | |

| CHARACTERISTIC | | TEST CIRCUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-------------------|--------------|--------------|--|------|------|------|------|
| Sharpness Control | Maximum Gain | 1 | (1) Input 2T pulse VBS to TP60 and TP63. (2) Measure 2T pulse output gain of data = 3FH, 20H, and 00H. 0dB is equal to the output gain of sharpness SW off. | 3.5 | 5.5 | 7.5 | dB |
| | Center Gain | | | 0.5 | 1.5 | 3.5 | |
| | Minimum Gain | | | -3 | -1 | 1 | |
| YNR Gain | | 1 | Note 7 | -20 | -13 | -8 | dB |
| Contrast Control | Center Gain | 1 | Measure Y output gain of data = 40H and 00H. Maximum Y gain is 0dB. | -4 | -5.5 | -7 | dB |
| | Minimum Gain | | | -17 | -19 | -21 | |
| γ Point | Va | 1 | Note 8 | 40 | 50 | 60 | IRE |
| | Vb | | | 80 | 90 | 100 | |
| γ Gain | Ga | 1 | | -1 | -3 | -5 | dB |
| | Gb | | | -4 | -6 | -8 | |
| Y S/N Ratio | | 1 | Note 9 | 50 | 55 | 60 | dB |

Chroma section 1 (PAL/NTSC)

| CHARACTERISTIC | | TEST CIRCUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|------------------------------------|---------|--------------|---|------|------|-------|-------------------|
| ACC Output Characteristic | e300 | 1 | Input rainbow signal whose burst and chroma signal level is 300mV _{p-p} and 100mV _{p-p} . Measure signal amplitude at pin 41. | 260 | 370 | 520 | mV _{p-p} |
| | e100 | | | 260 | 370 | 520 | |
| ACC Flatness | | 1 | e300 / e100 | 0.9 | 1.0 | 1.1 | — |
| Killer-on Level | PAL | 1 | Input color bar signal. Measure burst amplitude at which color begins to disappear when burst is gradually reduced. | 0.2 | 0.5 | 1.0 | mV _{p-p} |
| | NTSC | | | 0.2 | 0.5 | 1.0 | |
| Killer-off Level | PAL | 1 | Input color bar signal. Measure burst amplitude at which color begins to be tinted when burst is gradually increased from 0. | 1.0 | 2.5 | 4.0 | mV _{p-p} |
| | NTSC | | | 1.0 | 2.5 | 4.0 | |
| APC Pull-in Range | 3.58MHz | High | $f_0 = 3.579545\text{MHz}$ | 300 | 500 | 1000 | Hz |
| | | Low | | -300 | -500 | -1000 | |
| | 4.43MHz | High | $f_0 = 4.433619\text{MHz}$ | 300 | 500 | 1000 | Hz |
| | | Low | | -300 | -500 | -1000 | |
| | M PAL | High | $f_0 = 3.575611\text{MHz}$ | 300 | 500 | 1000 | Hz |
| | | Low | | -300 | -500 | -1000 | |
| VCXO Frequency Control Sensitivity | 4.43MHz | 1 | (1) Fix X'tal mode with bus. (2) Measure frequency changes at TP28 when varying TP26 voltage from 6.2V to 6.3V. | 1.7 | 2.4 | 3.2 | Hz / mV |
| | 3.58MHz | | | 1.5 | 2.2 | 3.0 | |
| | M PAL | | | 1.8 | 2.5 | 3.3 | |

| CHARACTERISTIC | | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|--------------|---------------|---|------|------|------|-------------------|
| f _{sc} Output Amplitude | 4.43MHz | 1 | (1) Fix X'tal mode with bus. (2) Measure signal amplitude at TP28. | 130 | 150 | 170 | mV _{p-p} |
| | 3.58MHz | | | 120 | 140 | 160 | |
| f _{sc} Output Voltage | 4.43MHz | 1 | (1) Fix X'tal mode with bus. (2) Measure DC voltage at TP28. | 3.6 | 3.9 | 4.2 | V |
| | 3.58MHz | | | 2.8 | 3.1 | 3.4 | |
| B-Y Output Amplitude | 4PAL | 1 | Input rainbow signal. Measure signal amplitude at pin 41. | 260 | 370 | 520 | mV _{p-p} |
| | 3NTSC | | | 260 | 370 | 520 | |
| R-Y Output Amplitude | 4PAL | 1 | Input rainbow signal. Measure signal amplitude at pin 40. | 220 | 315 | 440 | mV _{p-p} |
| | 3NTSC | | | 220 | 315 | 440 | |
| Relative Amplitude | 4PAL | 1 | Input rainbow signal. Measure (R-Y)/(B-Y) | 0.73 | 0.8 | 0.90 | — |
| | 3NTSC | | | 0.73 | 0.8 | 0.90 | |
| Relative Phase | 4PAL/4NTSC | 1 | Input rainbow signal. Measure θ (R-Y) - θ (B-Y) | 85 | 90 | 95 | ° |
| | 3NTSC | | | 85 | 90 | 95 | |
| Chroma Demodulation Bandwidth | | 1 | Note 10 | 0.5 | 0.8 | 1.5 | MHz |
| Residual Carrier Level | B-Y | 1 | Measure residual carrier waves (f _{sc} frequencies) on pin 40 and pin 41. | 0 | 3 | 5 | mV _{p-p} |
| | R-Y | | | 0 | 3 | 5 | |
| Residual Harmonics Level | B-Y | 1 | Measure residual higher harmonics (double the f _{sc} frequency) on pin 40 and pin 41. | 0 | 20 | 30 | mV _{p-p} |
| | R-Y | | | 0 | 20 | 30 | |
| TINT Control | TINT Maximum | 1 | (1) Input NTSC rainbow signal. (2) Measure TINT of data = 00H, 40H, and 7FH. (3) TINT 0° is when the 6th bar of B-Y is maximum. | 27 | 32 | 39 | ° |
| | TINT Center | | | -12 | -4 | 8 | |
| | TINT Minimum | | | -39 | -44 | -49 | |
| PAL/NTSC Color Difference Amplitude Adjustment Gain | | 1 | Note 11 | -2 | -1 | -0.5 | dB |
| PAL/NTSC/SECAM Identification Output | PAL | 1 | Measure output voltage from pin 39. | 8.0 | 8.3 | 8.6 | V |
| | SECAM | | | 4.3 | 4.6 | 4.9 | |
| | NTSC | | | 0.0 | 0.1 | 0.4 | |

Chroma section 2 (SECAM)

| CHARACTERISTIC | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---------------|---|------|------|------|------|
| Color System Identification Mode Switch Threshold Voltage | 1 | Measure voltage at pin 44 at which SECAM signal becomes unable to be demodulated when the DC voltage applied to TP44 is varied from 6V to 0V. | 4.7 | 5.0 | 5.3 | V |

| CHARACTERISTIC | | TEST CIRCUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|--|-------------------------------|--------------|---|-------|-------|-------|-------------------|
| ACC Characteristic | Input Id 150mV _{p-p} | 1 | (1) V ₃₂ = 1V (2) Measure ident amplitude at pin 28. | 220 | 280 | 340 | mV _{p-p} |
| | Input Id 50mV _{p-p} | | | 220 | 280 | 340 | |
| Killer-on Level | Ident Data = 0 | 1 | Input color bar signal. Measure burst amplitude at which color begins to disappear when burst is gradually reduced. | 0.1 | 1 | 3 | mV _{p-p} |
| | Ident Data = 1 | | | 0.1 | 1 | 3 | |
| B-Y Output Amplitude | | 1 | Input color bar signal. Measure output amplitude at pin 41. | 400 | 580 | 750 | mV _{p-p} |
| R-Y Output Amplitude | | 1 | Input color bar signal. Measure output amplitude at pin 40. | 450 | 680 | 950 | mV _{p-p} |
| BELL Monitor Switch Threshold Voltage | | 1 | Note 12 | 1.5 | 1.8 | 2.1 | V |
| BELL Filter Characteristic | Ident Ratio | 1 | Note 13 | 0.9 | 1.0 | 1.1 | — |
| | Cyan Bar | | | 1.00 | 1.15 | 1.30 | |
| | Yellow Bar | | | 1.10 | 1.25 | 1.40 | |
| BELL Filter f ₀ Control Range | | 1 | Data = 07 | 70 | 105 | 140 | kHz |
| | | | Data = 00 | - 175 | - 140 | - 105 | |
| PLL Pull-in Range | | 1 | High | 4.75 | 5 | 5.5 | MHz |
| | | | Low | 3 | 3.7 | 3.9 | |
| Black Level Offset Voltage | | 1 | Note 14 | - 15 | 0 | 15 | mV |
| Black Level Offset Adjustment | Maximum | | | 19 | 24 | 29 | |
| | Minimum | | | - 31 | - 28 | - 25 | |
| SECAM Color Difference Amplitude Adjustment Gain | | 1 | Note 15 | - 1.0 | - 1.8 | - 2.5 | dB |
| | | | | - 2 | - 1 | - 0.5 | |
| | | | | - 0.5 | 0 | 0.5 | |
| | | | | 0.5 | 1 | 1.5 | |

TEXT / Matrix section

| CHARACTERISTIC | | TEST CIRCUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|--------------------------------------|--|--------------|---|------|------|------|------------------|
| RGB Maximum Output | | 1 | Measure maximum output voltage from pin 16 when WPL is off. | 7.3 | 7.7 | 8.8 | V |
| Color Difference Input Dynamic Range | | 1 | Measure input dynamic range at pin 37 and pin 38. | 1.6 | 2.0 | 2.3 | V _{p-p} |
| Relative Amplitude | | 1 | Input PAL rainbow signal. Measure G / B in the color difference output mode selected by bus on RGB output pins. | 0.31 | 0.37 | 0.42 | — |
| Relative Phase | | 1 | Input PAL rainbow signal. Measure $\theta (G) - \theta (B)$ in the color difference output mode selected by bus on RGB output pins. | 230 | 237 | 245 | ° |

| CHARACTERISTIC | | TEST CIRCUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT | |
|---------------------------------------|----------------------|--------------|---|---|------|------|---------|---|
| Color Control Characteristic | Maximum Gain | 1 | Note 16 | 18 | 19.5 | 21 | dB | |
| | Center Gain | | | -9 | -7 | -5 | | |
| | Minimum Gain | | | -80 | -50 | -40 | | |
| | Maximum Gain Voltage | | | 3.2 | 3.5 | 3.8 | V | |
| | Minimum Gain Voltage | | | 2.2 | 2.5 | 2.8 | | |
| Contrast Control Characteristic | Maximum Gain | 1 | Note 17 | 3.5 | 5 | 6.5 | dB | |
| | Minimum Gain | | | -16 | -14 | -12 | | |
| | Maximum Gain Voltage | | | 2.2 | 2.5 | 2.8 | V | |
| | Minimum Gain Voltage | | | 1.2 | 1.5 | 1.8 | | |
| Brightness Control Characteristic | Maximum Voltage | 1 | (1) No Y input. (AC GND) (2) Data = FFH. Measure DC voltage at pin 18 during trace period. (3) Data = 80H. Measure DC voltage at pin 18 during trace period. (4) Data = 00H. Measure DC voltage at pin 18 during trace period. | 3.2 | 3.5 | 3.8 | V | |
| | Center Voltage | | | 1.8 | 2.0 | 2.2 | | |
| | Minimum Voltage | | | 0.2 | 0.5 | 0.8 | | |
| | Control Voltage (1) | 1 | | Measure DC voltage at pin 18 during trace period when $V_{53} = 1V$. | 0.7 | 1.0 | 1.3 | V |
| | Control Voltage (2) | | | Measure DC voltage at pin 18 during trace period when $V_{53} = 3V$. | 2.7 | 3.0 | 3.3 | |
| Brightness Tracking | | 1 | Measure DC voltage difference between R, G and B outputs of brightness data = 40H. | -0.2 | 0 | 0.2 | V | |
| WPL Voltage | | 1 | Measure maximum output voltage from pin 18 when WPL is on. | 5.7 | 6.0 | 6.3 | V | |
| Blanking Output Voltage | | 1 | Measure output voltage from pin 18 during blanking period. | 0.3 | 0.5 | 0.8 | V | |
| Vertical Blanking Period | 50Hz | 1 | Measure vertical blanking period width. | — | 23 | — | H | |
| | 60Hz | | | — | 18 | — | | |
| Horizontal Blanking Threshold Voltage | | 1 | Measure lowest voltage at pin 9 which causes horizontal blanking. | 0.5 | 0.7 | 1.0 | V | |
| Horizontal Blanking Delay Time | 1 | | Measure blanking-on delay time. | 0.0 | 0.1 | 0.3 | μS | |
| | | | Measure blanking-off delay time. | 0.1 | 0.3 | 0.5 | | |
| External Blanking Threshold Current | | 1 | Measure minimum input current to pin 64 which causes blanking. | 300 | 330 | 400 | μA | |
| Mute Output Voltage | | 1 | Note 18 | 1.7 | 2.0 | 2.3 | V | |
| Mute Switch Threshold Voltage | | | | 4.7 | 5.0 | 5.3 | | |

| CHARACTERISTIC | | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|------------------------------------|--------------|---------------|---|------|------|------|------------------|
| External TEXT Input Dynamic Range | | 1 | Measure input dynamic range on pin 22, pin 23 and pin 24. | 1.0 | 1.5 | — | V _{p-p} |
| External TEXT Contrast Control | Maximum Gain | 1 | (1) Input signal 3 (V _{im} = 0.1V _{p-p}) to TP24. (2) Measure output amplitude at pin 18 when data = 7FH, 40H, and 00H as V ₁₈ . (3) Gain = 20log (V ₁₈ / 0.1) | 15 | 16 | 18 | dB |
| | Center Gain | | | 12 | 13.5 | 15 | |
| | Minimum Gain | | | -7 | -4 | -2 | |
| External TEXT Rising Time | | 1 | (1) Load capacitance is 10pF. (2) Adjust contrast data so that RGB output amplitude is 1V _{p-p} . | 10 | 25 | 50 | ns |
| External TEXT Falling Time | | | | 10 | 25 | 50 | |
| External TEXT Output Delay Time | | | | 10 | 25 | 50 | |
| External TEXT Switching Delay Time | | | | 10 | 25 | 50 | |
| TV/TEXT Switching Voltage | | 1 | Note 19 | 0.7 | 1.0 | 1.3 | V |
| Crosstalk | TV→TEXT | 1 | Note 20 | -45 | -55 | — | dB |
| | TEXT→TV | | Note 21 | -45 | -55 | — | |
| External TEXT Bandwidth | | 1 | Note 22 | 12 | 15 | 20 | MHz |
| All White Mode Output Voltage | R Output | 1 | (1) Select all-white mode by bus. (2) Measure R, G, and B amplitudes during trace period. | 3.6 | 3.8 | 4.0 | V _{p-p} |
| | G Output | | | 3.5 | 3.7 | 3.9 | |
| | B Output | | | 3.6 | 3.8 | 4.0 | |

Sync. section

| CHARACTERISTIC | | TEST CIR-CUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|--|------|---------------|---|-------|-------|-------|-------|
| Horizontal Sync. Separation Level | | 1 | Note 23 | 30 | 35 | 40 | % |
| Sync. Separation Input Sensitivity | | 1 | Note 24 | 10 | 18 | 25 | μA |
| Horizontal Free Running Frequency | | 1 | Measure H.out frequency when no sync. input and no FBP input. | 15.50 | 15.62 | 15.75 | kHz |
| AFC1 Pull-in Range | High | 1 | Center frequency is f _H = 15.625Hz | 500 | 750 | 1000 | Hz |
| | Low | | | -500 | -750 | -1000 | |
| Horizontal Oscillation Frequency Control Range | | 1 | Note 25 | 14.70 | 15.62 | 16.90 | Hz |
| Horizontal Oscillation Frequency Control Sensitivity | | 1 | Note 26 | 2.0 | 2.3 | 2.6 | kHz/V |
| AFC1 Detection Current | | 1 | Note 27 | 250 | 350 | 450 | μA |

| CHARACTERISTIC | | TEST CIRCUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|----------------------------|--------------|--|-----------|-----------|-----------|---------|
| AFC1 Stop Period | 50Hz | 1 | Observe pin 2 to measure the period while AFC1 does not operate. | — | 308~6 | — | H |
| | 60Hz | | | — | 258~6 | — | |
| Horizontal Oscillation Starting Voltage | | 1 | Note 28 | 3.5 | 4.0 | 4.5 | V |
| Horizontal Output Starting Voltage | | | | 4.0 | 4.5 | 5.0 | |
| Horizontal Output Duty Cycle | | 1 | Measure duty cycle = (High period) / (1H period) at pin 6. | 38 | 41 | 44 | % |
| Horizontal Output Voltage | High | 1 | Measure high voltage at pin 6. | 4.7 | 5.0 | 5.3 | V |
| | Low | | Measure low voltage at pin 6. | — | 0 | 0.3 | |
| AFC2 Control Range | | 1 | Note 29 | 14 | 15 | 16 | μ s |
| Horizontal Phase Adjustment Range | | 1 | Note 30 | ± 2.0 | ± 2.5 | ± 3.0 | μ s |
| Vertical Free Running Frequency | | 1 | Measure output frequency at pin 64 when no sync. signal input. | — | 50 / 60 | — | Hz |
| Vertical Pull-in Range | | 1 | Note 31 | 240.5 | — | 352 | H |
| Vertical 60Hz Identification Range | | | | 240.5 | — | 288 | |
| Vertical Pulse Output Voltage | High | 1 | Measure high voltage at pin 64 | 4.2 | 4.5 | 4.8 | V |
| | Low | | Measure low voltage at pin 64 | — | 0 | 0.3 | |
| Vertical Blanking Pulse Output Voltage | | 1 | Measure middle voltage at pin 64 | 2.7 | 3.0 | 3.3 | V |
| Vertical Output Delay Time | 50Hz | 1 | Note 32 | 4.25 | 4.75 | 5.25 | H |
| | 60Hz | | | 0.25 | 0.75 | 1.25 | |
| Vertical Output Phase Variable Range | | 1 | Sync. input 60Hz, data = 000, 111 | 0 | — | 7 | H |
| SCP Output Voltage | Clamp Gate Pulse Period | 1 | Note 33 | 7.3 | 7.5 | 7.8 | V |
| | Horizontal Blanking Period | | | 4.2 | 4.5 | 4.8 | |
| | Vertical Blanking Period | | | 2.2 | 2.5 | 2.8 | |
| FBP Input Terminal Voltage | High | 1 | (1) Sink current into pin 9 is kept at 0.1mA when measured. | 1.1 | 1.5 | 1.8 | V |
| | Low | | (2) Measure high and low voltages at pin 9. | — | 0 | 0.3 | |
| Gate Pulse Width | | 1 | Note 33 | 1.8 | 2.0 | 2.2 | μ s |

| CHARACTERISTIC | | TEST CIRCUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|------------------|--------------------|--------------|----------------|------|------|------|------|
| Gate Pulse Phase | Sync. Signal Input | 1 | | | | | μs |
| | PAL Gate 0 | | | | | | |
| | PAL Gate 1 | | | | | | |
| | SECAM Gate 0 | | | | | | |
| | SECAM Gate 1 | | | | | | |

TEST CONDITION

Note 1. Maximum Y gain

- (1) Input signal 1 ($f_o = 100\text{kHz}$, $V_{im} = 0.3V_{p-p}$) to TP60 and TP63.
- (2) Contrast data = 7FH. $V_{56} = 5V$.
- (3) Measure picture signal amplitude at pin 18. $\rightarrow V_{18}$.
- (4) Maximum Y gain = $20\log(V_{18}/0.3)$.

Note 2. Y frequency band width

- (1) Input signal 1 ($V_{im} = 0.3V_{p-p}$) to TP60 and TP63.
- (2) Measure picture signal amplitude at pin 18 when $f_o = 100\text{kHz}$. $\rightarrow V_{18}$.
- (3) Find the value of f_o at which the picture amplitude at pin 18 becomes -3dB of V_{18} when f_o is varied from 100kHz to 15MHz.

Note 3. Black stretching amplifier maximum gain

- (1) Input signal 1 ($f_o = 500\text{kHz}$, $V_{im} = 0.1V_{p-p}$) to TP60 and TP63.
- (2) $V_{57} = 3.2V$, $V_{61} = 2V$.
- (3) Measure picture signal amplitude at pin 58 $\rightarrow V_{58}$.
- (4) Black stretching amplifier maximum gain = $V_{58}/0.1$.

Note 4. Black stretching start point

- (1) Input signal 2 to TP60 and TP63.
- (2) $V_{57} = 3.15V$.
- (3) Measure picture signal amplitude at pin 58 while varying V_{im} from 0IRE to 100IRE. $\rightarrow V_{58}$.
- (4) Obtain V_{st} as the figure1.

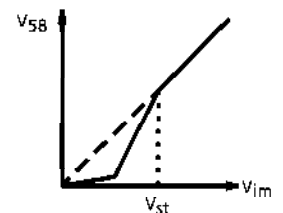
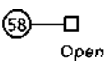


Figure 1

Note 5. DC restoration ratio

- (1) Keep pin 58 open. 
- (2) Input APL = 10%, 90% ramp waveforms to TP60 and TP63.
- (3) $V_{57} = 2.1V$.
- (4) Measure pedestal level DC voltage at pin 18 difference between APL = 10% and 90%. $\rightarrow \Delta V$.
- (5) Measure output signal picture amplitude on pin 18. $\rightarrow V_{im}$.
- (6) DC restoration ratio = $(V_{im} - \Delta V \times 1.25) / V_{im}$

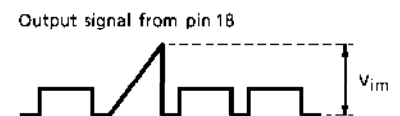


Figure 2

Note 6. Black stretching start voltage

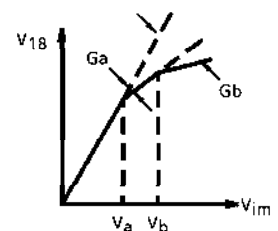
- (1) Input signal 1 ($f_0 = 100\text{kHz}$, $V_{im} = 0.3V_{p-p}$) to TP60 and TP63.
- (2) Measure the voltage at pin 61 which causes the output signal amplitude at pin 18 to be bigger than output signal when $V_{61} = 4V$, while varying the voltage at pin 61 from 4V to 2.5V.

Note 7. YNR gain

- (1) Input signal 1 ($f_0 = 2.5\text{MHz}$, $V_{im} = 50\text{mV}_{p-p}$) to TP60 and TP63.
- (2) Measure output amplitude ratio at pin 18 when turning YNR on and off.

Note 8. γ point / γ gain

- (1) Input signal 2 to TP60 and TP63.
- (2) $V_{56} = 3.5V$, $V_{57} = 2.1V$.
- (3) Measure picture signal amplitude at pin 18 while varying V_{im} from 0IRE to 100IRE. $\rightarrow V_{18}$.
- (4) Find and calculate V_a , V_b , G_a and G_b .



Note 9. Y S/N ratio

- (1) Input signal 2 to TP60 and TP63.
- (2) $V_{56} = 3.5V$, $V_{57} = 2.1V$, $V_{61} = 3.5V$.
- (3) Measure picture signal amplitude at pin 18 when $V_{im} = 0$ and 100IRE. $\rightarrow V_0$, V_{100} .
- (4) $S/N \text{ ratio} = 20\log(V_{100}/V_0)$.

Note 10. Chroma demodulation bandwidth

- (1) Input signal 2 to TP63.
- (2) Input CW signal with frequency f_0 to TP51.
- (3) $V_{42} = 6.8V$, $V_{26} = 6.2V$; set X'tal mode to 3.58MHz and set color mode to NTSC by bus.
- (4) Measure output amplitude at pin 41 when f_0 is 3.579545MHz + 1kHz. $\rightarrow V_{41}$.
- (5) Find the value of f_0 at which the picture amplitude at pin 41 becomes -3dB of V_{41} when f_0 is varied from 3.579545MHz + 100kHz to +2MHz.

Note 11. PAL/NTSC color difference amplitude adjustment gain

- (1) Input rainbow signal to TP63, TP51, and TP49.
- (2) Measure output amplitude at pin 41 when data = 0. $\rightarrow V_0$.
- (3) Measure output amplitude at pin 41 when data = 1. $\rightarrow V_1$.
- (4) Adjustment gain = $20\log(V_1/V_0)$.

Note 12. BELL monitor switch threshold voltage

- (1) Input SECAM color bar signal to TP63, TP60 and TP49.
- (2) Apply DC voltage to pin 32.→ V_{32} .
- (3) Measure the voltage at which output from pin 28 changes into BELL filter output while V_{32} is varied from 3V to 1V.

Note 13. BELL filter characteristic

- (1) Input SECAM color bar signal to TP63, TP60 and TP49.
- (2) $V_{32} = 1V$
- (3) Measure the following amplitude ratios at pin 28 :
 - (R-Y line Ident)/(B-Y line Ident) amplitude ratio
 - (Cyan bar of R-Y)/Ident amplitude ratio
 - (Yellow bar of B-Y)/Ident amplitude ratio

Note 14. Black level offset voltage, black level offset adjustment

- (1) Input SECAM black signal (with Ident and chroma signal) to TP63, TP60 and TP49.
- (2) Black level adjustment data = 88H.
- (3) Measure voltage difference between blanking and trace period at pin 40 and pin 41.→Black level offset voltage.
- (4) Measure voltage changes during trace period when black level adjustment data is varied from 88H to 00H and FFH→Black level offset adjustment.

Note 15. SECAM color difference amplitude adjustment gain

- (1) Input rainbow signal to TP63, TP60 and TP49.
- (2) Measure output amplitude at pin 41 when data = 10.→0dB.
- (3) Measure output amplitude at pin 41 when data = 00, 01 and 11. Compare with the measurement when data = 00.

Note 16. Color control characteristic

- (1) Input signal 3 ($f_0 = 100kHz$, $V_{im} = 0.1V_{p-p}$) to TP38 and signal 2 ($V_{im} = 100IRE$) to TP63.
- (2) Contrast data = 40H.
- (3) Color data = 7FH.
- (4) Measure output amplitude at pin 18→ V_{18} .
- (5) Maximum gain = $20\log(V_{18}/0.1)$.

- (6) Measure output amplitude at pin 18 when color data = 40H and 00H. Compare with the maximum gain (= 0dB).
- (7) Apply DC voltage to TP11. → V_{11} .
- (8) Measure the minimum voltage of V_{11} at which the output amplitude of pin 18 becomes maximum while V_{11} is varied from 3V to 5V.
- (9) Measure the maximum voltage of V_{11} at which the output amplitude of pin 18 becomes minimum while V_{11} is varied from 3V to 0V.

Note 17. Contrast control characteristic

- (1) Input Signal 3 ($f_0 = 100\text{kHz}$, $V_c = 0.1V_{p-p}$) to TP38 and signal 2 ($V_{im} = 100\text{IRE}$) to TP63.
- (2) Color data = 40H.
- (3) Contrast data = 40H. Measure output amplitude at pin 18. → V_{18} .
- (4) Contrast data = 7FH. Measure output amplitude at pin 18. → V_{18}' .
- (5) Maximum gain = $20\log(V_{18}' / V_{18})$.
- (6) Contrast data = 00H. Measure output amplitude at pin 18. → V_{18}'' .
- (7) Minimum gain = $20\log(V_{18}'' / V_{18})$.
- (8) Apply DC voltage to TP25. → V_{25} .
- (9) Measure the minimum voltage of V_{25} at which the output amplitude on pin 18 becomes maximum while V_{25} is varied from 2V to 4V.
- (10) Measure the maximum voltage of V_{25} at which the output amplitude on pin 18 becomes minimum while V_{25} is varied from 2V to 0V.

Note 18. Mute output voltage, mute switch threshold voltage

- (1) Input signal 2 ($V_{im} = 100\text{IRE}$) to TP63.
- (2) Apply DC voltage to TP21. → V_{21} .
- (3) $V_{21} = 5.5\text{V}$
- (4) Measure DC output voltage at pin 18 during trace period → Mute Output Voltage.
- (5) Measure the voltage of V_{21} at which the trace period at pin 18 is muted while V_{21} is varied from 4V to 6V.

Note 19. TV/TEXT switching voltage

- (1) Input signal 2 ($V_{im} = 100\text{IRE}$) to TP63.
- (2) Apply DC voltage to TP21. → V_{21} .
- (3) Measure the voltage of V_{21} at which output from pin 18 is changed from TEXT input to TV input while V_{21} is varied from 2V to 0V.

Note 20. Crosstalk (TV→TEXT)

- (1) Input signal 1 ($V_{im} = 0.3V_{p-p}$) to TP60 and TP63. Connect TP22, TP23 and TP24 to AC GND.
- (2) Contrast data = 7FH, Brightness data = 80H, Sharpness SW-Off.
- (3) Connect TP21 to GND.
Measure picture amplitude during trace period at TP18 when $f_o = 1MHz \rightarrow V_{18}$.
- (4) Apply TP21 to 1.5V. Measure picture amplitude at TP18 $\rightarrow V_{18}'$.
- (5) Crosstalk [dB] = $20\log (V_{18} / V_{18}')$.

Note 21. Crosstalk (TEXT→TV)

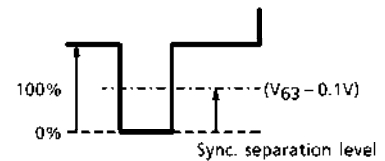
- (1) Input signal 1 ($V_{im} = 0.3V_{p-p}$) to TP63, TP22, TP23 and TP24. Connect TP60 to AC GND.
- (2) Contrast data = 7FH, Brightness data = 80H.
- (3) Connect TP21 to 1.5V.
Measure picture amplitude during trace period at TP18 when $f_o = 1MHz \rightarrow V_{18}$.
- (4) Connect TP21 to GND. Measure picture amplitude at TP18 $\rightarrow V_{18}'$.
- (5) Crosstalk [dB] = $20\log (V_{18} / V_{18}')$.

Note 22. External TEXT bandwidth

- (1) Input signal 2 ($V_{im} = 100IRE$) to TP63 and signal 3 ($V_{im} = 0.3V_{p-p}$) to TP24.
- (2) Measure picture signal amplitude at pin 18 when $f_o = 100kHz \rightarrow V_{18}$.
- (3) Find the value of f_o at which the picture signal amplitude at pin 18 becomes -3dB of V_{18} while f_o is varied from 100kHz to 15MHz.

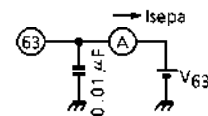
Note 23. Horizontal Sync. separation level

- (1) Connect TP63 to AC GND.
- (2) Measure DC voltage at pin 63. $\rightarrow V_{63}$.
- (3) Input signal 2 ($V = 2V_{p-p}$) to TP63.
- (4) Measure the level at which the DC voltage ($V_{63} - 0.1V$) crosses the waveform of pin 63 relative to sync. tip (=0%).



Note 24. Sync. separation input sensitivity

Measure the value of I_{sepa} when the output frequency of pin 64 changes, while V_{63} is varied from 4V to 1V.



Note 25. Horizontal oscillation frequency control range

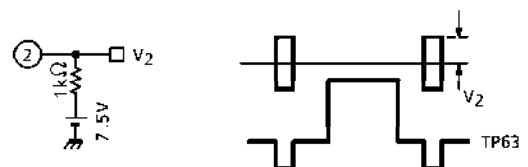
- (1) Apply DC voltage to TP2. $\rightarrow V_2$.
- (2) Measure the output frequencies at pin 6, when V_2 is 8.5V, 7.5V and 6.5V.

Note 26. Horizontal oscillation frequency control sensitivity

- (1) Apply DC voltage to TP2. $\rightarrow V_2$.
- (2) Measure changes in output frequency at pin 6 when varying V_2 from 7.6V to 7.7V.

Note 27. AFC1 detection current

- (1) Input signal 2 ($V = 2V_{p-p}$) to TP63.
- (2) Observe waveform at pin 2 and measure V_2 .
- (3) Detection current = $V_2 / 1k\Omega$.

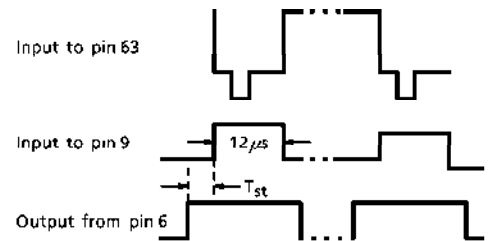


Note 28. Horizontal oscillation starting voltage, horizontal output starting voltage

- (1) Measure the value of $H.V_{CC}$ at which oscillation waveform can be observed at TP3 when varying $H.V_{CC}$ from 0V to 9V. →Horizontal Oscillation Starting Voltage.
- (2) Measure the value of $H.V_{CC}$ at which horizontal output can be observed at pin 6 when increasing $H.V_{CC}$ higher.→Horizontal Output Starting Voltage.

Note 29. AFC2 control range

- (1) Input signal 2 ($V_{im} = 100IRE$) to TP63.
- (2) Adjust the width of FBP from the FBP generator (Unit2) to be $12\mu s$.
- (3) Measure the value of T_{st} at which the phase relationship begins to be not synchronous while varying T_{st} from $10\mu s$ to $17\mu s$ from the FBP generator.



Note 30. Horizontal phase adjustment

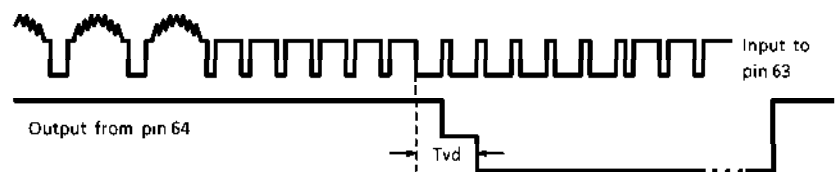
- (1) Input signal 2 ($V_{im} = 100IRE$) to TP63.
- (2) Adjust the FBP width to be $12\mu s$ from the FBP generator.
- (3) Adjust the T_{st} to be $8\mu s$ from the FBP generator.
- (4) Measure phase changes of data = 1FH and 00H relative to the phase relationship of data = 10H.

Note 31. Vertical pull-in range, vertical 60Hz identification range

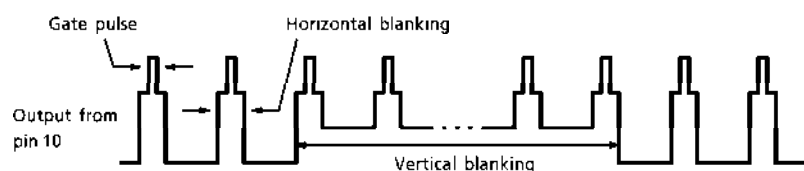
- (1) Input signal 2 ($V = 2V_{p-p}$) to TP63.
- (2) Measure the range of vertical frequencies where synchronization between the input signal and the TP64 output can be achieved while varying the vertical frequency from 40Hz to 70Hz.
- (3) Measure the vertical frequency range where 60Hz is identified against other frequencies by reading the bus during measurement in (2) above.

Note 32. Vertical output delay time

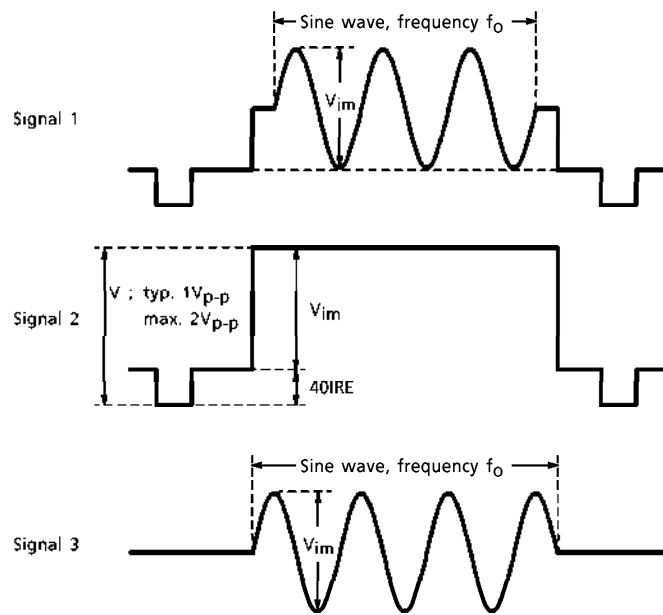
- (1) Input Signal 2 ($V = 2V_{p-p}$) to TP63.
- (2) Vertical phase data = 000.
- (3) Measure the T_{vd} .



Note 33. SCP output voltage, gate pulse width

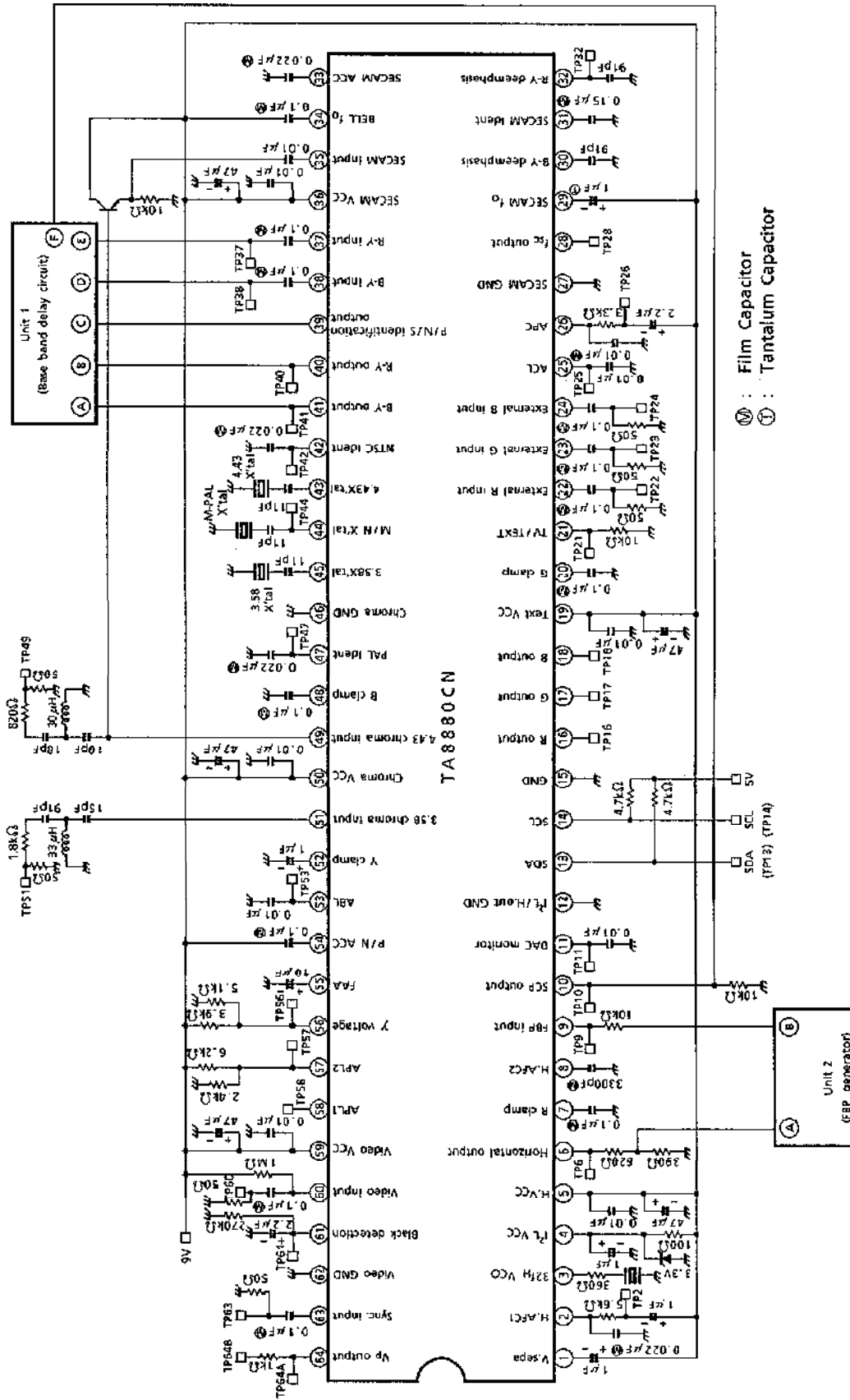


TEST SIGNALS



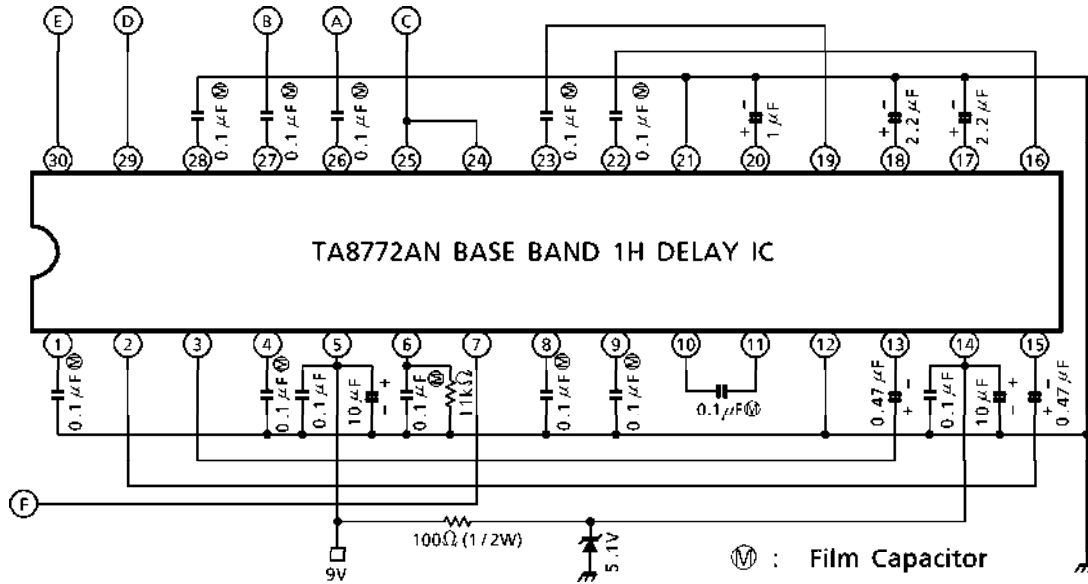
TEST CIRCUIT 1

Main unit



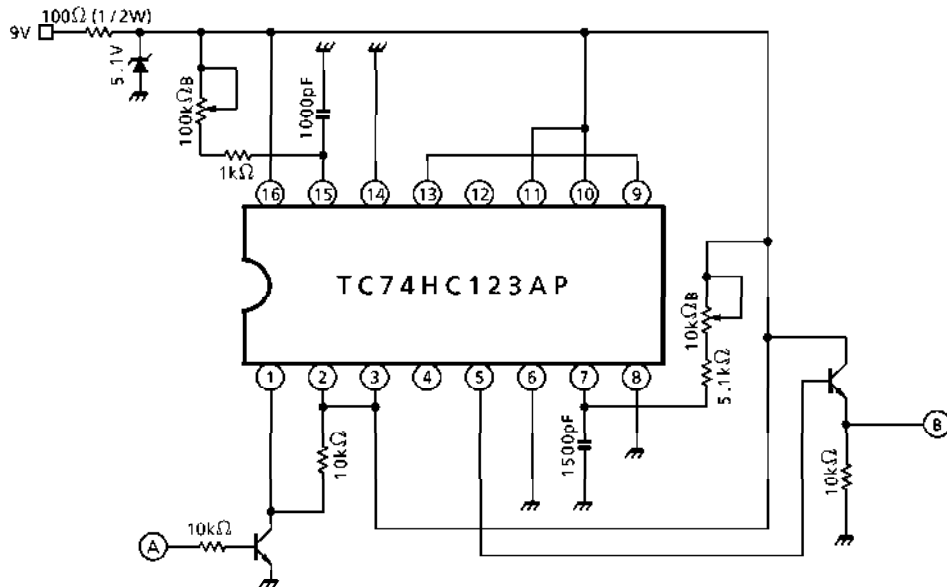
TEST CIRCUIT 2

Unit 1
(Base band delay circuit)

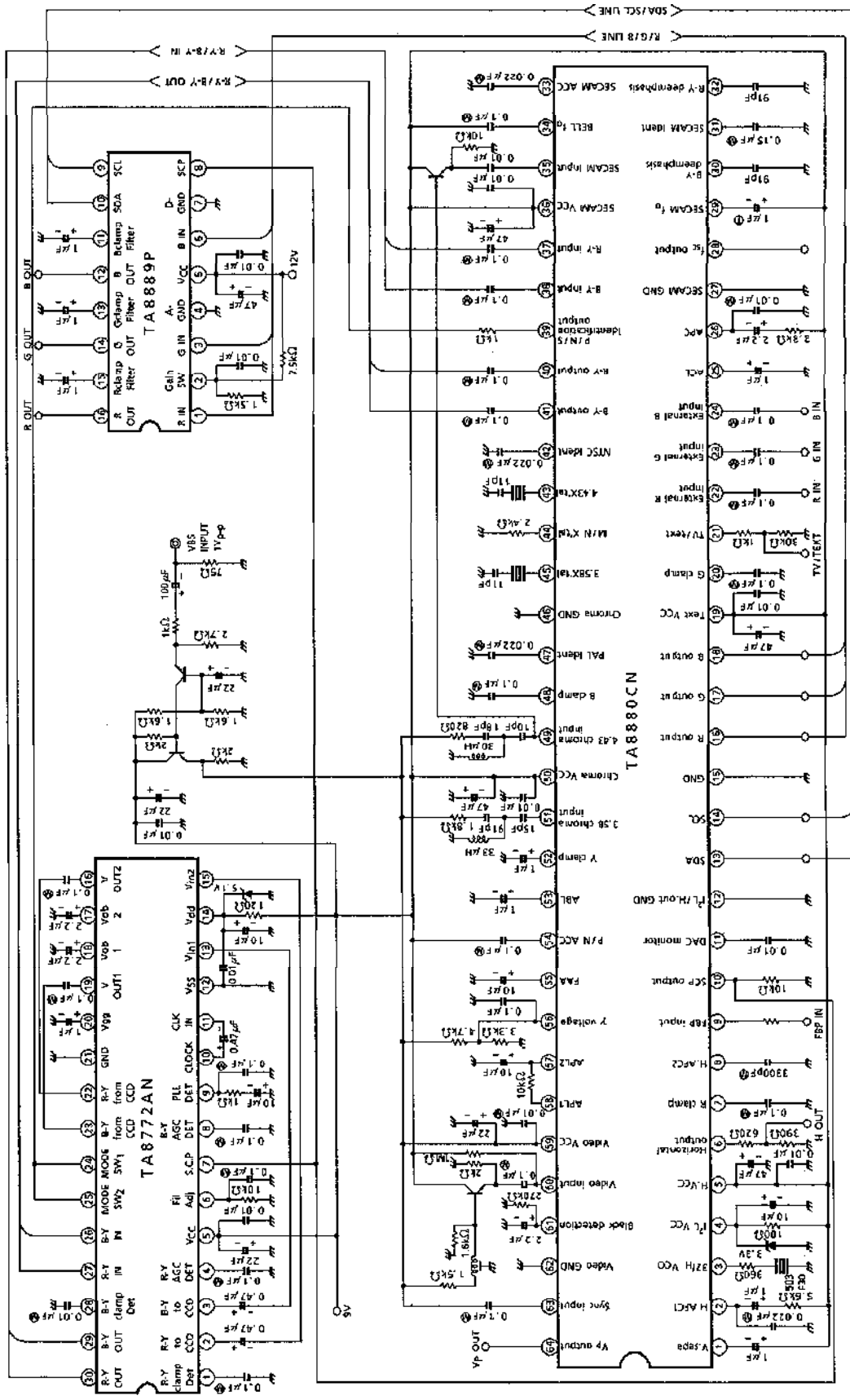


TEST CIRCUIT 3

Unit 2
(FBP generator)



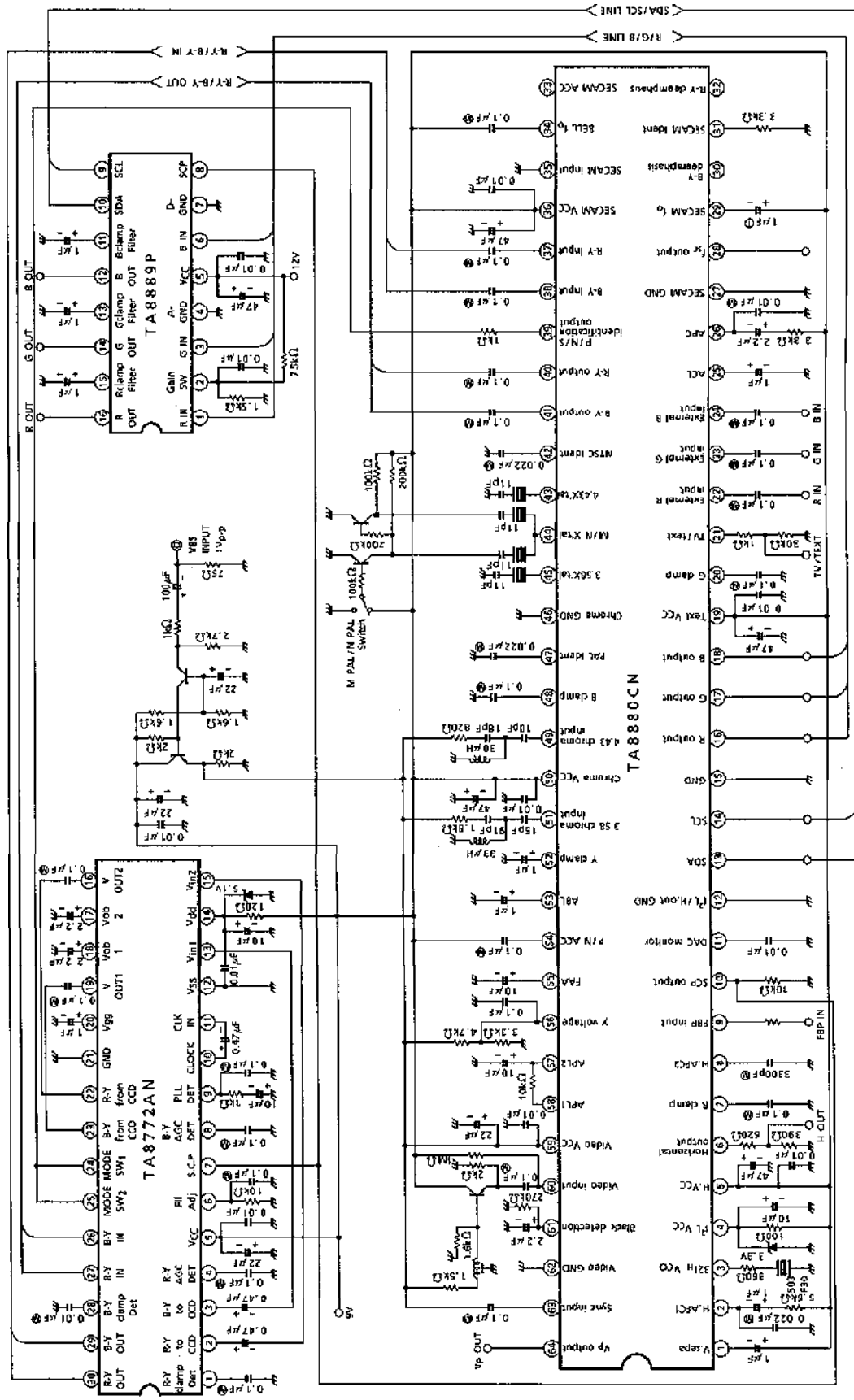
APPLICATION EXAMPLE CIRCUIT 1 (FOR PAL/NTSC/SECAM)



○ : Film Capacitor
 ○ : Tantalum Capacitor

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APPLICATION EXAMPLE CIRCUIT 2 (FOR NTSC/M PAL/N PAL)

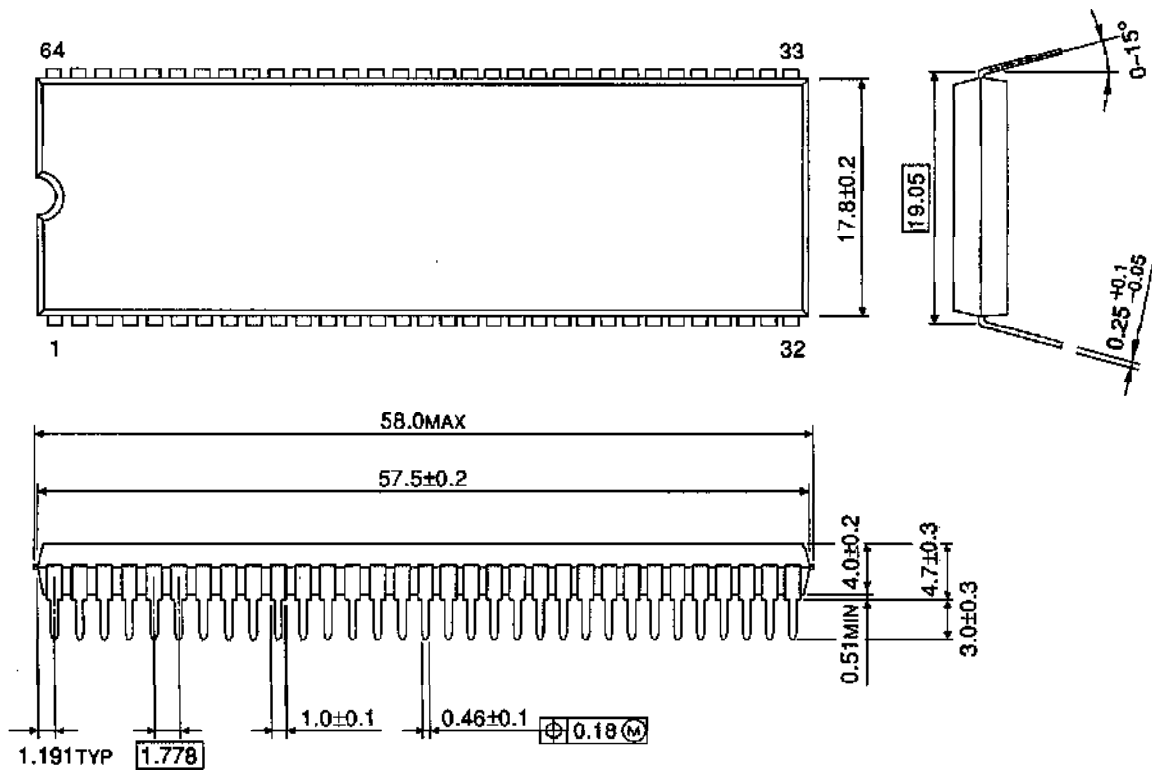


⊗ : Film Capacitor
 ○ : Tantalum Capacitor

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PACKAGE DIMENSIONS
SDIP64-P-750-1.78

Unit : mm



Weight : 8.85g (Typ.)

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000707EBA

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