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# M52390FP

## NTSC/PAL Encoder

REJ03F0080-0100Z

Rev.1.0

Sep.22.2003

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### Description

The M52390FP is a semiconductor integrated circuit that has a function for converting R, G and B signals into NTSC/PAL composite video signals, as well as a superimpose function, on a single chip.

### Features

- RGB encoder-related
  - Built-in LPF for color discrimination. An external resistor enables cutoff frequency control.
  - An internal VCA circuit enables gain control of the chroma unit.
  - A high-precision modulation circuit and clamping circuit realize low carrier leaks.
  - Burst and synch signals are generated in the IC.
- Superimpose-related
  - $Y_S$  IN (control input) enables switching between two input signals, VIDEO IN and RGB IN.
  - An internal high-speed analog switch makes it possible to insert fine text.
  - An internal APC circuit automatically adjusts the color phases of new screen (VIDEO IN) and RGB encoder signals.
- Overall
  - The VIDEO OUT signal is output at  $2 V_{P-P}$ , making it possible to configure a  $75 \Omega$  drive circuit with a single transistor.
  - Both NTSC and PAL are supported.

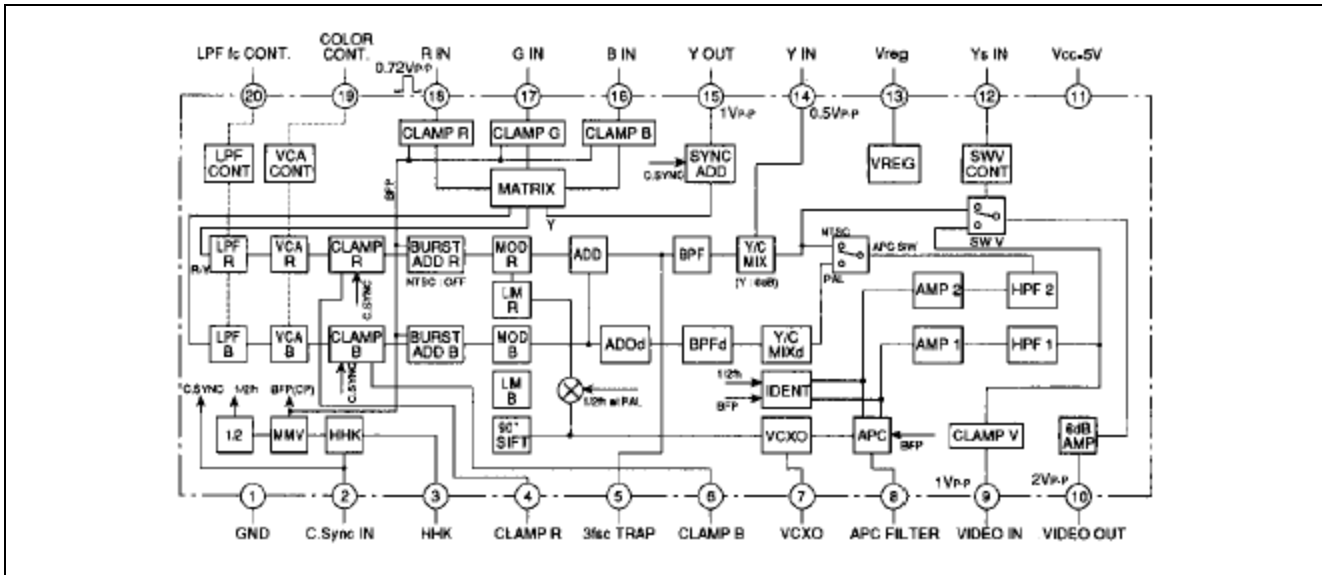
### Application

- TVs, VCRs, monitors and other audio/video devices

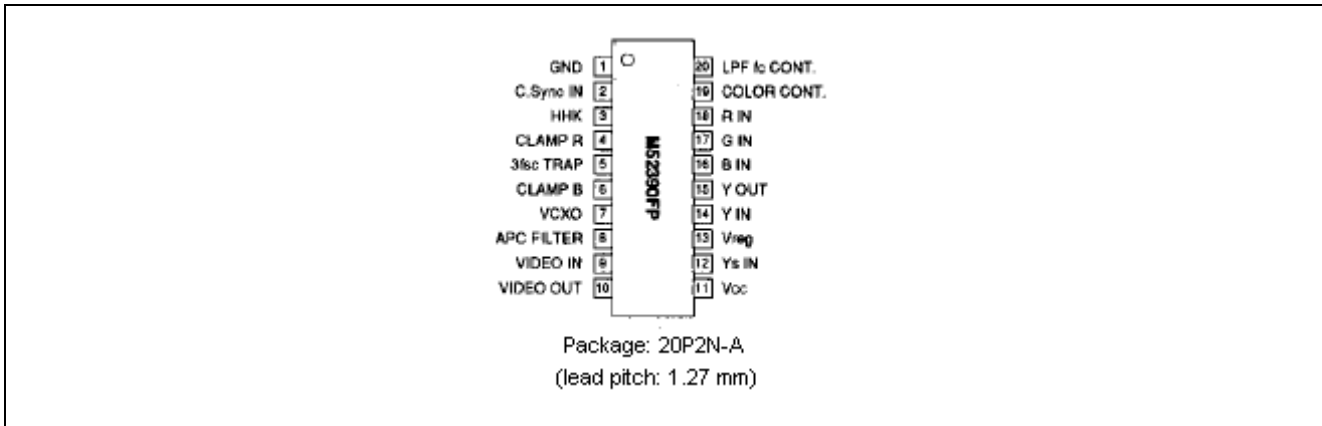
### Recommended Operating Conditions

- Power supply voltage range: 4.7 to 5.3 V
- Recommended power supply voltage: 5.0 V

Block Diagram



Pin Configuration



Description of Pin

| Pin no.   | Pin name   | Pin peripheral circuit | Pin voltage  | Notes  |   |   |   |        |      |     |       |      |     |
|---|--|------------------------|--|--|---|---|---|--------|------|-----|-------|------|-----|
| 1   | GND  |                        |  |  |   |   |   |        |      |     |       |      |     |
| 2   | C.SYVC IN  |                        | <p>AC: Sync input</p>                                | $V_{TH} = 2.5 V \pm 0.3 V$   |   |   |   |        |      |     |       |      |     |
| 3   | HHK  |                        | <p>AC</p>  | <p>The HHK pulse width can be varied using the external resistor.<br/>Recommended value:<br/>HHK: 3/4H</p> <p>R = 91 k<br/>C = 270 p</p>   |   |   |   |        |      |     |       |      |     |
| 4   | OFFSET R   |                        | <p>DC = 3.1 V</p>                                    | <p>External recommended value.<br/>C = 0.1 µ.</p>  |   |   |   |        |      |     |       |      |     |
| 5   | TRAP   |                        | <p>AC: Chroma</p> <p>Burst: 300 mV<sub>P-P</sub></p> | <p>External recommended value.</p> <table border="0"> <tr> <td></td> <td>L</td> <td>C</td> </tr> <tr> <td>NTSC :</td> <td>15 µ</td> <td>12P</td> </tr> <tr> <td>PAL :</td> <td>10 µ</td> <td>12P</td> </tr> </table> |   | L | C | NTSC : | 15 µ | 12P | PAL : | 10 µ | 12P |
|   |  |                        |  | L  | C |   |   |        |      |     |       |      |     |
| NTSC :  | 15 µ   | 12P                    |  |  |   |   |   |        |      |     |       |      |     |
| PAL :   | 10 µ   | 12P                    |  |  |   |   |   |        |      |     |       |      |     |
| <p>[15] Test mode output at 5 V</p> <p>[12] Hi: R-Y output</p> <p>[12] Lo: B-Y output</p> | <p>[5] 5 V: Test mode setting</p> <p>[15] Pulse output</p> |                        |  |  |   |   |   |        |      |     |       |      |     |

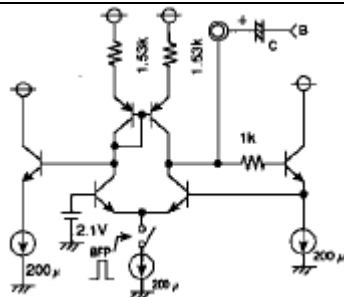
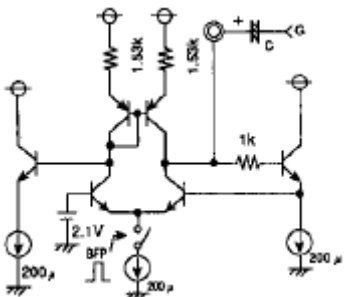
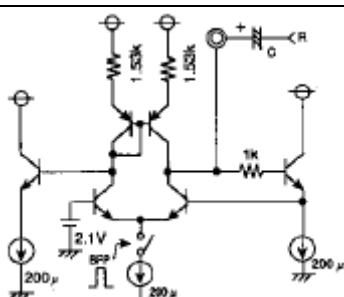
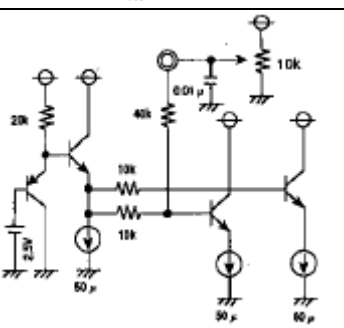
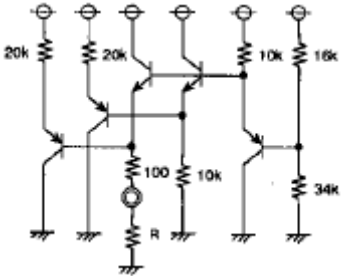
Description of Pin (cont)

| Pin no. | Pin name   | Pin peripheral circuit | Pin voltage   | Notes   |
|---------|------------|------------------------|---|---|
| 6       | OFFSET B   |                        | DC: 3.1 V   | External recommended value<br>C = 0.1 µ   |
| 7       | VCXO IN    |                        | DC: 3.2 V   | The free run frequency is set using the trimmer capacitor.<br>[7] 0 V: Carrier OFF                                      |
| 8       | APC FILTER |                        | DC: 3.3 V<br>In Free Run mode:<br>DC: 2.7 V         | β characteristic<br>Frequency<br><br>APC voltage<br>External recommended values<br>R = 1.5 k<br>C1 = 0.01 µ<br>C2 = 1 µ |
| 9       | VIDEO IN   |                        | AC: VIDEO 1 V <sub>P-P</sub><br>Pedestal: 2.9 V<br> | Clamping input (burst timing)<br>External recommended value<br>C = 4.7 µ<br>[9] 0 V: Free Run mode setting              |

Description of Pin (cont)

| Pin no. | Pin name        | Pin peripheral circuit | Pin voltage   | Notes   |      |           |    |     |    |     |
|---------|-----------------|------------------------|---|---|------|-----------|----|-----|----|-----|
| 10      | VIDEO OUT       |                        | AC: VIDEO 2 V <sub>P-P</sub><br>Pedestal: 1.8 V<br>                                       |   |      |           |    |     |    |     |
| 11      | V <sub>CC</sub> |                        | DC: 5 V   | I <sub>CC</sub> : 50 mA   |      |           |    |     |    |     |
| 12      | Y <sub>s</sub>  |                        | Switching signal input when using Superimpose<br><br>Hi: Insertion screen (RGB IN output) | V <sub>TH</sub> = 1.5 V ± 0.3 V<br>Hi: RGB IN output<br>Lo: VIDEO IN output<br><br>[15 Output setting when using 5 V<br>[5] Output<br><table border="1"> <tr> <td>[12]</td> <td>[5]output</td> </tr> <tr> <td>Hi</td> <td>R-Y</td> </tr> <tr> <td>Lo</td> <td>B-Y</td> </tr> </table> | [12] | [5]output | Hi | R-Y | Lo | B-Y |
| [12]    | [5]output       |                        |   |   |      |           |    |     |    |     |
| Hi      | R-Y             |                        |   |   |      |           |    |     |    |     |
| Lo      | B-Y             |                        |   |   |      |           |    |     |    |     |
| 13      | VRE G           |                        | DC: 2.1 V   | External recommended value<br>C = 4.7 µ<br><br>PAL mode at 2 mA   |      |           |    |     |    |     |
| 14      | Y IN            |                        | AC: Y 0.5 V <sub>P-P</sub><br>Pedestal: 2.1 V<br>   |   |      |           |    |     |    |     |
| 15      | Y OUT           |                        | AC: Y 1 V <sub>P-P</sub><br>Pedestal: 2.1 V<br>   | (5) Test mode output at 5 V<br>Pulse output<br><br>[12] 5 V: Test mode setting<br><table border="1"> <tr> <td>[12]</td> <td>[5]output</td> </tr> <tr> <td>Hi</td> <td>R-Y</td> </tr> <tr> <td>Lo</td> <td>B-Y</td> </tr> </table>   | [12] | [5]output | Hi | R-Y | Lo | B-Y |
| [12]    | [5]output       |                        |   |   |      |           |    |     |    |     |
| Hi      | R-Y             |                        |   |   |      |           |    |     |    |     |
| Lo      | B-Y             |                        |   |   |      |           |    |     |    |     |

Description of Pin (cont)

| Pin no. | Pin name    | Pin peripheral circuit  | Pin voltage                                | Notes   |
|---------|-------------|---|--|---|
| 16      | B IN        |    | AC: B 0.71 V <sub>P-P</sub><br>Sync: 2.9 V | Clamping input (burst timing)<br>External recommended value<br>C = 4.7 µ                                |
| 17      | G IN        |    | AC: G 0.71 V <sub>P-P</sub><br>Sync: 2.9 V | Clamping input (burst timing)<br>External recommended value<br>C = 4.7 µ                                |
| 18      | R IN        |   | AC: R 0.71 V <sub>P-P</sub><br>Sync: 2.9 V | Clamping input (burst timing)<br>External recommended value<br>C = 4.7 µ                                |
| 19      | COLOR CONT. |  | DC: 2.5 V                                  | Color control for RGB encoder output<br>5 V: Chroma unit +2 dB<br>2.5 V: Typ.<br>0 V: Chroma unit -3 dB |
| 20      | fc. CONT.   |  | DC: 3.3 V                                  | fc of LPF can be adjusted using external resistor.<br>External recommended value<br>R = 30 k            |

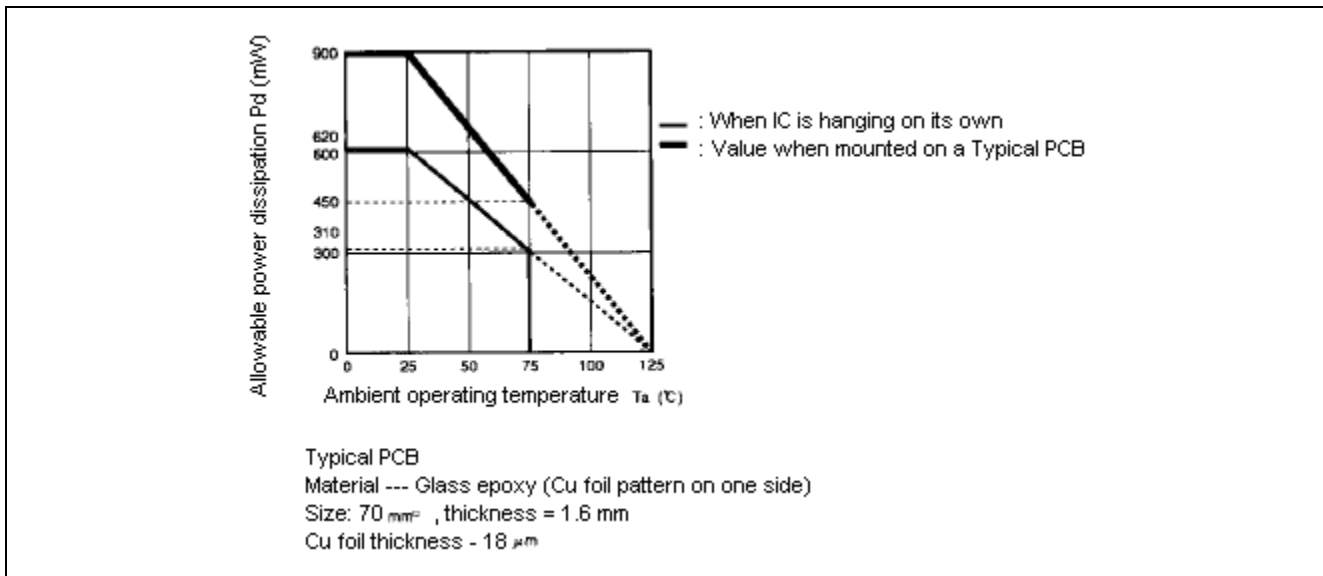
**Absolute Maximum Rating**

(Unless otherwise noted, Ta = 25°C)

| Symbol | Item                          | Ratings      | Units |
|--------|-------------------------------|--------------|-------|
| Vcc    | Power supply voltage          | 7            | V     |
| Pd     | Internal current consumption  | 620<br>(900) | mW    |
| Topr   | Ambient operating temperature | -20 to 75    | °C    |
| Tstg   | Storage temperature           | -40 to 125   | °C    |
| kθ     | Thermal derating (Ta = 25°C)  | 6.2<br>(9.0) | mW/°C |

Note: Values in parentheses are the values when mounted on a typical PCB.

**Thermal Derating (Maximum Rating)**



## Electrical Characteristics

(unless otherwise noted, Ta=25°C, Vcc = 5 V, SG2 = sync)

| No.                     | Symbol              | Item   | Measurement conditions   | Mea-<br>sure-<br>ment<br>point | Limits |      |      | Unit |
|-------------------------|---------------------|--|--|--------------------------------|--------|------|------|------|
|                         |                     |  |  |                                | Min.   | Typ. | Max. |      |
| 1                       | I <sub>CC1</sub>    | Circuit current 1                            | NTSC MODE, [12] 5 V  | [11]                           | 35     | 50   | 65   | mA   |
| 2                       | I <sub>CC2</sub>    | Circuit current 2                            | NTSC MODE, [12] 5 V  | [11]                           | 37     | 52   | 67   | mA   |
| <b>RGB IN → Y OUT</b>   |                     |  |  |                                |        |      |      |      |
| 3                       | ER                  | Matrix ratio R                               | SG18: 1 Vp-p   | [15]                           | 0.27   | 0.30 | 0.33 | Vp-p |
| 4                       | EG                  | Matrix ratio G                               | SG17: 1 Vp-p   | [15]                           | 0.53   | 0.59 | 0.65 | Vp-p |
| 5                       | EB                  | Matrix ratio B                               | SG16: 1 Vp-p   | [15]                           | 0.09   | 0.11 | 0.13 | Vp-p |
| 6                       | EY                  | At RGB 100% Y level                          | SG16, SG17, SG18: 0.71 Vp-p  | [15]                           | 0.63   | 0.71 | 0.79 | Vp-p |
| 7                       | FR                  | R IN → Y OUT<br>frequency characteristic     | SG18: 500 kHz/5 MHz, 0.5 Vp-p CW,<br>SW16, 17, 18:ON<br>[2] 0 V (SG2: OFF)   | [15]                           | -1.5   | 0    | 1.5  | dB   |
| 8                       | FG                  | G IN → Y OUT<br>frequency characteristic     | SG17: 500 kHz/5 MHz, 0.5 Vp-p CW,<br>SW16, 17, 18:ON<br>[2] 0 V (SG2: OFF)   | [15]                           | -1.5   | 0    | 1.5  | dB   |
| 9                       | FB                  | B IN → Y OUT<br>frequency characteristic     | SG16: 500 kHz/5 MHz, 0.5 Vp-p CW,<br>SW16, 17, 18:ON<br>[2] 0 V (SG2: OFF)   | [15]                           | -1.5   | 0    | 1.5  | dB   |
| 10                      | VS1                 | Sync level 1                                 | NTSC MODE  | [15]                           | 257    | 286  | 315  | Vp-p |
| 11                      | VS2                 | Sync level 2                                 | PAL MODE (SW13: ON)  | [15]                           | 270    | 300  | 330  | Vp-p |
| <b>Y IN → VIDEO OUT</b> |                     |  |  |                                |        |      |      |      |
| 12                      | G <sub>Y</sub>      | Y IN → VIDEO OUT gain                        | SG14: 500 kHz, 0.5 Vp-p CW,<br>[12] 5 V  | [10]                           | 10.5   | 12   | 13.5 | dB   |
| 13                      | F <sub>Y</sub>      | Y IN → VIDEO OUT<br>frequency characteristic | SG14: 500 kHz, 0.5 Vp-p CW,<br>[12] 5 V  | [10]                           | -1.5   | 0    | 1.5  | dB   |
| <b>RGB IN → TRAP</b>    |                     |  |  |                                |        |      |      |      |
| 14                      | D <sub>L(R-Y)</sub> | Delay (R-Y)                                  | SG18: 1 Vp-p<br>[15] 5 V, [12] 5 V, [7] 0 V  | [5]                            | 210    | 310  | 410  | ns   |
| 15                      | D <sub>L(B-Y)</sub> | Delay (B-Y)                                  | SG16: 1 Vp-p<br>[15] 5 V, [12] 0 V, [7] 0 V  | [5]                            | 210    | 310  | 410  | ns   |
| 16                      | G <sub>H(R-Y)</sub> | Gain (R-Y) VCA: Hi                           | SG18: 500 kHz, 0.5 Vp-p CW,<br>SW4, 6, 17, 18: ON<br>[15] 5 V, [12] 5 V, [7] 0 V,<br>[19] 5 V/2.5 V, [2] 0V (SG2: OFF) | [5]                            | 1      | 2    | 3.5  | dB   |
| 17                      | G <sub>H(B-Y)</sub> | Gain (B-Y) VCA: Hi                           | SG16: 500 kHz, 0.5 Vp-p CW,<br>SW4, 6, 17, 18: ON<br>[15] 5 V, [12] 0 V, [7] 0 V,<br>[19] 5 V/2.5 V, [2] 0V (SG2: OFF) | [5]                            | 1      | 2    | 3.5  | dB   |
| 18                      | G <sub>L(R-Y)</sub> | Gain (R-Y) VCA: Lo                           | SG18: 500 kHz, 0.5 Vp-p CW,<br>SW4, 6, 17, 18: ON<br>[15] 5 V, [12] 5 V, [7] 0 V,<br>[19] 0 V/2.5 V, [2] 0V (SG2: OFF) | [5]                            | -4.5   | -3   | -2   | dB   |
| 19                      | G <sub>L(B-Y)</sub> | Gain (B-Y) VCA: Lo                           | SG18: 500 kHz, 0.5 Vp-p CW,<br>SW4, 6, 17, 18: ON<br>[15] 5 V, [12] 5 V, [7] 0 V,<br>[19] 0 V/2.5 V, [2] 0V (SG2: OFF) | [5]                            | -4.5   | -3   | -2   | dB   |

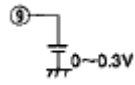
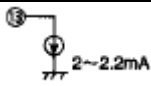
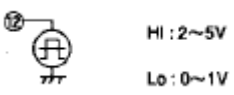
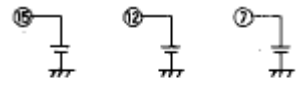



## Electrical Characteristics (cont)

| No.                         | Symbol           | Item  | Measurement conditions  | Measurement point | Limits |      |      | Unit  |
|-----------------------------|------------------|---|---|-------------------|--------|------|------|-------|
|                             |                  |   |   |                   | Min.   | Typ. | Max. |       |
| <b>RGB IN → VIDEO OUT</b>   |                  |   |   |                   |        |      |      |       |
| 20                          | V <sub>B1</sub>  | NTSC burst level                              | NTSC MODE<br>[12] 5 V   | [10B]             | 243    | 286  | 329  | mVp-p |
| 21                          | V <sub>B2</sub>  | PAL burst level                               | PAL MODE (SW13: ON)<br>[12] 5 V                                       | [10B]             | 255    | 300  | 345  | mVp-p |
| 22                          | V <sub>B3</sub>  | PAL burst level differential                  | PAL MODE (SW13: ON)<br>[12] 5 V                                       | [10B]             | -30    | 0    | 30   | mVp-p |
| 23                          | P <sub>PB</sub>  | PAL burst phase differential                  | PAL MODE (SW13: ON)<br>[12] 5 V                                       | [10B]             | 82     | 90   | 98   | deg   |
| 24                          | V <sub>R/B</sub> | R/burst level ratio                           | SG18: 0.71 Vp-p<br>[12] 5 V   | [10B]             | 2.68   | 3.15 | 3.62 |       |
| 25                          | V <sub>G/B</sub> | G/burst level ratio                           | SG17: 0.71 Vp-p<br>[12] 5 V   | [10B]             | 2.51   | 2.95 | 3.39 |       |
| 26                          | V <sub>B/B</sub> | B/burst level ratio                           | SG16: 0.71 Vp-p<br>[12] 5 V   | [10B]             | 1.91   | 2.25 | 2.59 |       |
| 27                          | V <sub>C/B</sub> | NTSC MODE carrier leak                        | NTSC MODE<br>[12] 5 V   | [10B]             | —      | -40  | -28  | dB    |
| 28                          | P <sub>R/B</sub> | R/burst phase differential                    | SG18: 0.71 Vp-p<br>[12] 5 V   | [10B]             | 96     | 104  | 112  | deg   |
| 29                          | P <sub>G/B</sub> | G/burst phase differential                    | SG17: 0.71 Vp-p<br>[12] 5 V   | [10B]             | 233    | 241  | 249  | deg   |
| 30                          | P <sub>B/B</sub> | B/burst phase differential                    | SG16: 0.71 Vp-p<br>[12] 5 V   | [10B]             | 339    | 347  | 355  | deg   |
| <b>VIDEO IN → VIDEO OUT</b> |                  |   |   |                   |        |      |      |       |
| 31                          | GVIO             | VIDEO IN → VIDEO OUT gain                     | SG9: 500 kHz, 0.5 Vp-p CW,<br>SW9: ON<br>[12] 0 V, [2] 0 V (SG2: OFF) | [10]              | 5      | 6    | 7    | dB    |
| 32                          | FVIO             | VIDEO IN → VIDEO OUT frequency characteristic | SG9: 5 MHz, 0.5 Vp-p CW,<br>SW9: ON<br>[12] 0 V, [2] 0 V (SG2: OFF)   | [10]              | -1.5   | 0    | 1.5  | dB    |
| <b>SUPER IMPOSE</b>         |                  |   |   |                   |        |      |      |       |
| 33                          | PDI              | RGB/VIDEO IN burst phase differential         | SG9: 3.85 MHz, 286 mVp-p CW,<br>SG12: 1 Vp-p                          | [10B]             | -5     | 0    | 5    | deg   |
| 34                          | VOS              | DC offset                                     | SG9: burst, 286 mVp-p CW,<br>SG12: 1 Vp-p                             | [10]              | -20    | 0    | 20   | mV    |
| <b>MMV</b>                  |                  |   |   |                   |        |      |      |       |
| 35                          | HHK              | HHK width                                     | PAL MODE (SW13: ON)<br>[5] 5V   | [2]<br>[15]       | 40     | 47   | 54   | μs    |
| 36                          | BFPP             | BFP position (burst position)                 | [5] 5V  | [2]<br>[15]       | 4.5    | 5.6  | 6.7  | μs    |
| 37                          | BFPW             | BFP width (burst width)                       | [5] 5V  | [15]              | 2.0    | 2.5  | 3.0  | μs    |

## Electrical Characteristics Measurement Method

Tables for the various modes (common to all tests)

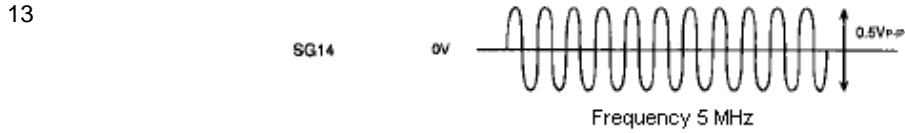
| Mode   | Setting condition   | Function   |      |      |        |      |      |        |      |        |        |      |        |   |
|--|---|--|------|------|--------|------|------|--------|------|--------|--------|------|--------|---|
| FREE RUN MODE  |    | VCXO FREE RUN  |      |      |        |      |      |        |      |        |        |      |        |   |
| PAL MODE   |    | Carrier phase for MOD R reversed at each 1H                    |      |      |        |      |      |        |      |        |        |      |        |   |
| SUPER IMPOSE MODE  |    | [10] VIDEO OUT<br>RGB ENCODE signal out<br>VIDEO IN signal out |      |      |        |      |      |        |      |        |        |      |        |   |
| TEST MODE MR<br>TEST MODE MB<br>TEST MODE DR<br>TEST MODE DB |  <table border="1"> <tr> <td>4.7~5V</td> <td>2~5V</td> <td>OPEN</td> </tr> <tr> <td>4.7~5V</td> <td>0~1V</td> <td>OPEN</td> </tr> <tr> <td>4.7~5V</td> <td>2~5V</td> <td>0~0.3V</td> </tr> <tr> <td>4.7~5V</td> <td>0~1V</td> <td>0~0.3V</td> </tr> </table> | 4.7~5V   | 2~5V | OPEN | 4.7~5V | 0~1V | OPEN | 4.7~5V | 2~5V | 0~0.3V | 4.7~5V | 0~1V | 0~0.3V | [5] Color difference output<br>MOD R-Y out<br>MOD B-Y out<br>DIFF R-Y out<br>DIFF B-Y out |
| 4.7~5V   | 2~5V  | OPEN   |      |      |        |      |      |        |      |        |        |      |        |   |
| 4.7~5V   | 0~1V  | OPEN   |      |      |        |      |      |        |      |        |        |      |        |   |
| 4.7~5V   | 2~5V  | 0~0.3V   |      |      |        |      |      |        |      |        |        |      |        |   |
| 4.7~5V   | 0~1V  | 0~0.3V   |      |      |        |      |      |        |      |        |        |      |        |   |
| TEST MODE P  |    | [10] PULSE output<br>PAL MODE: BFP, HHK mix<br>NTSC MODE: BFP  |      |      |        |      |      |        |      |        |        |      |        |   |
| V4, V6, V9,<br>V16, V17, V18                                 | Various pin voltages when SYNC is input to [2] (C. SYNC IN)<br>(for clamping)   |  |      |      |        |      |      |        |      |        |        |      |        |   |

Measurement method and method for computing limit values

| Meas. no.  | Measurement method and method for computing limit values |       |   |
|--|--|-------|---|
| 1  | Current flowing into [11] is measured.                   |       |   |
| 2  |  |       |   |
| 3  | SG2  | 5V    |   |
| 4  |  | 0V    |   |
| 5  | SG16<br>(SG17)<br>(SG16)                                 | 1V    |   |
|  |  | 0V    |   |
|  | Ⓜ output   |       |   |
| 6  | SG2  | 5V    |   |
|  |  | 0V    |   |
|  | SG16<br>SG17<br>SG16                                     | 0.71V |   |
|  |  | 0V    |   |
|  | Ⓜ output   |       |   |
| 7<br>(8, 9)  | SG16<br>(SG17)<br>(SG16)                                 | 0V    | <p> <math>f = 500\text{kHz} / 5\text{MHz}</math><br/> <math>0.5\text{Vpp CW}</math> </p> <p> <math>F = 20 \log \frac{V_{\text{out}}(5\text{MHz})}{V_{\text{out}}(500\text{kHz})} \text{ (dB)}</math> </p> |
|  | Ⓜ output   |       |   |
|  |  |       |   |
| 10   | SG2  | 5V    |   |
| 11   |  | 0V    |   |
|  | Ⓜ output   |       |   |
| 12   | SG14   | 0V    | <p>Frequency 500 kHz</p> <p>0.5Vpp</p>  |
| <p>The 500 kHz component V12 with respect to [10] is measured, and is computed using the following equation.</p> |  |       | $G_V = 20 \log \frac{V_{12}}{0.5\text{Vpp}} \text{ (dB)}$   |

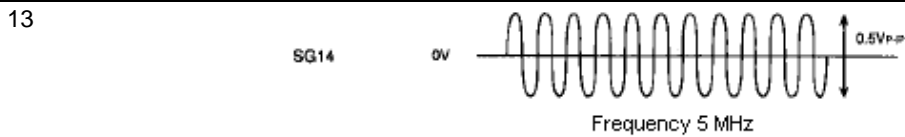
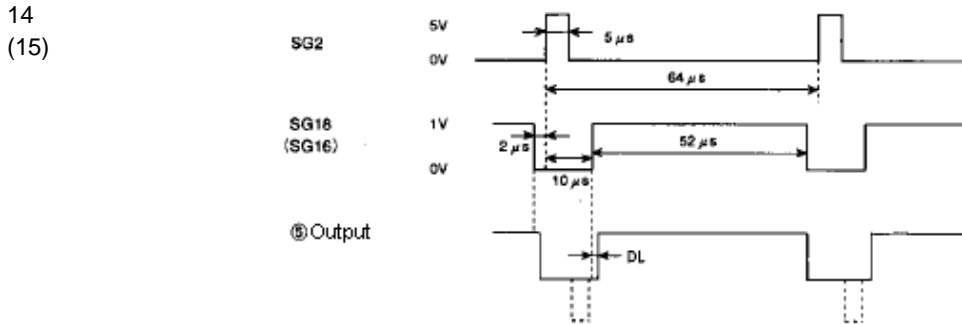
Measurement method and method for computing limit values (cont)

Meas. no. Measurement method and method for computing limit values



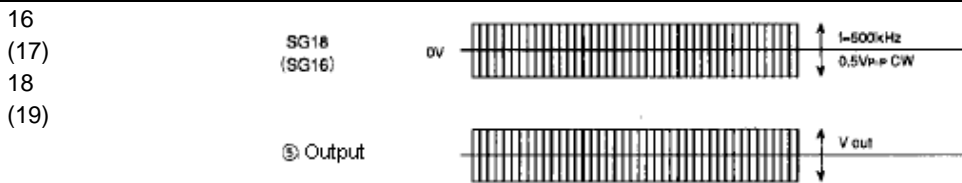
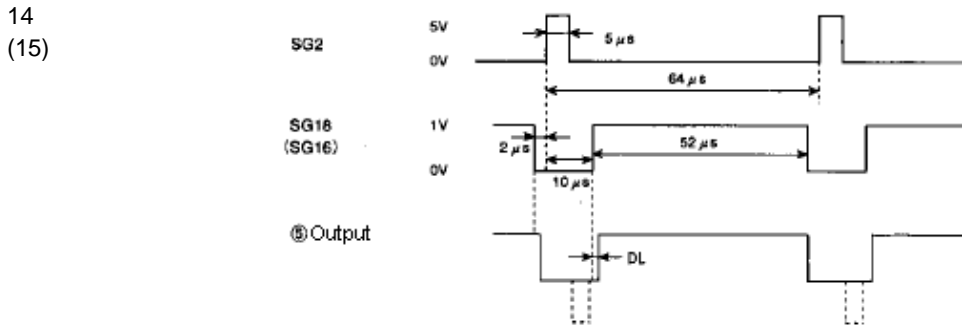
The 500 MHz component V13 with respect to (10) is measured, and is computed using the following equation.

$$fcY = 20 \log \frac{V_{13}}{V_{12}} \text{ (dB)}$$



The 500 MHz component V13 with respect to (10) is measured, and is computed using the following equation.

$$fcY = 20 \log \frac{V_{13}}{V_{12}} \text{ (dB)}$$



$$GH = 20 \log \frac{V_{out} \text{ (Ⓢ 5V)}}{V_{out} \text{ (Ⓢ 2.5V)}} \text{ (dB)}$$

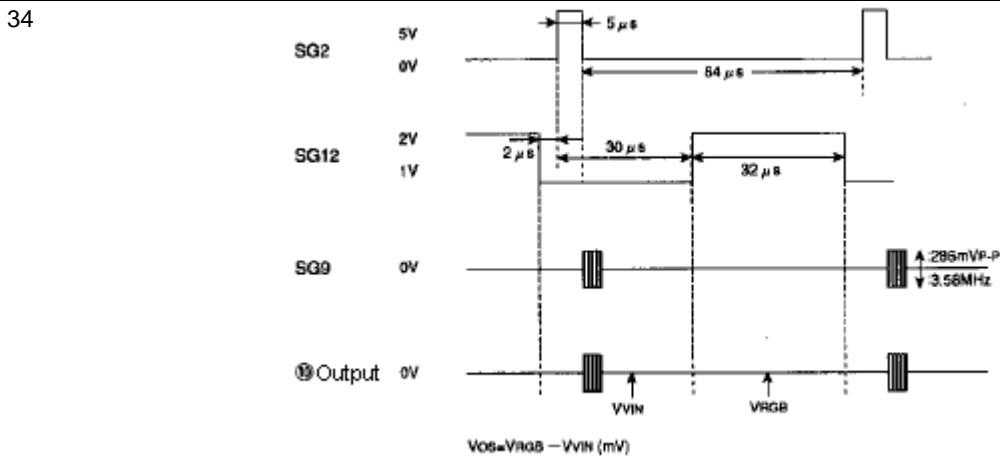
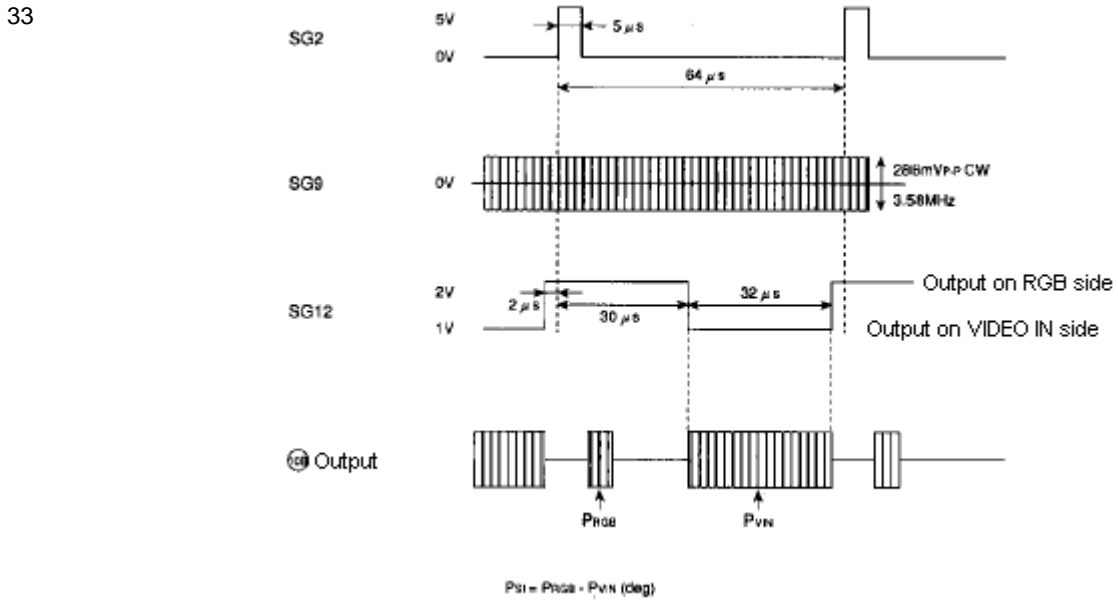
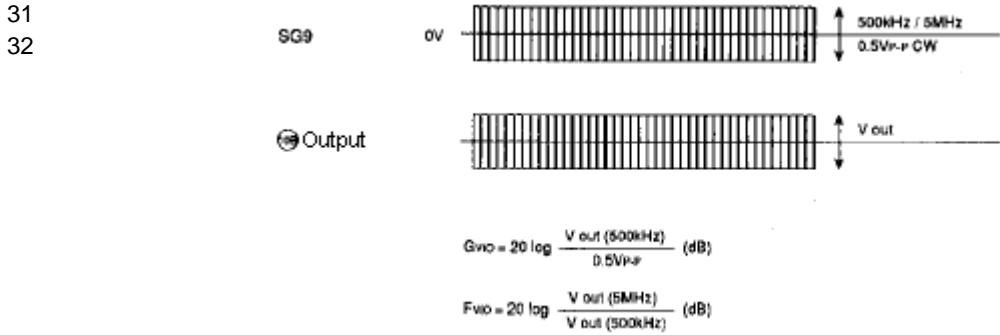
$$GL = 20 \log \frac{V_{out} \text{ (Ⓢ 0V)}}{V_{out} \text{ (Ⓢ 2.5V)}} \text{ (dB)}$$

Measurement method and method for computing limit values (cont)

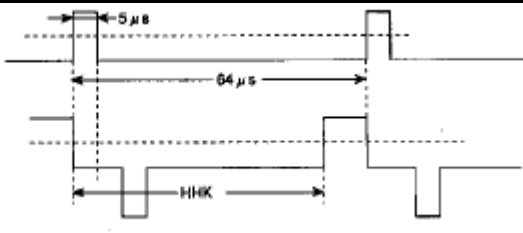
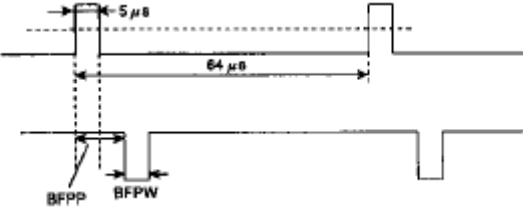
| Meas. no.      | Measurement method and method for computing limit values |  |
|----------------|--|--|
| 20<br>21<br>22 | SG2  | <p> <math>V_{S1} = V_{nH}</math><br/> <math>V_{S2} = V_{nH}</math><br/> <math>V_{S3} = V_{nH} - V_{(n+1)H}</math> </p> |
| 23             | SG2  | <p> <math>P_{PS} =  P_{nH} \text{ burst phase} - P_{(n+1)H} \text{ burst phase} </math> </p>                           |
| 24<br>(25, 26) | SG2<br><br>SG18<br>(SG17)<br>(SG16)                      | <p> <math>R(G, B) / \text{Burst level ratio} = \frac{V_c}{V_n}</math> </p>   |
| 27             | SG2  | <p> <math>VC/B = 20 \log \frac{V_c}{V_a} \text{ (dB)}</math> </p>  |
| 28<br>(29, 30) | SG2<br><br>SG18<br>(SG17)<br>(SG16)                      |  |

Measurement method and method for computing limit values (cont)

Meas. no. Measurement method and method for computing limit values



Measurement method and method for computing limit values (cont)

| Meas. no. | Measurement method and method for computing limit values  |
|-----------|---|
| 35        | <p>SG2 5V<br/>2.5V<br/>0V</p> <p>ⓂOutput 2.8V</p> <p>5 <math>\mu</math>s<br/>64 <math>\mu</math>s<br/>HHK</p>  <p>Detailed description: This timing diagram shows two signals. The top signal, SG2, is a square wave with a pulse width of 5 <math>\mu</math>s and a period of 64 <math>\mu</math>s. The bottom signal, Output, shows a corresponding response with a period of 64 <math>\mu</math>s. A horizontal interval labeled 'HHK' is shown between the start of the SG2 pulse and the start of the Output pulse.</p>    |
| 36        | <p>SG2 5V<br/>2.5V<br/>0V</p> <p>ⓂOutput</p> <p>5 <math>\mu</math>s<br/>64 <math>\mu</math>s<br/>BFPP<br/>BFPW</p>  <p>Detailed description: This timing diagram shows two signals. The top signal, SG2, is a square wave with a pulse width of 5 <math>\mu</math>s and a period of 64 <math>\mu</math>s. The bottom signal, Output, shows a corresponding response. Two intervals are marked: 'BFPP' (before first pulse period) and 'BFPW' (before first pulse width), both starting from the beginning of the SG2 pulse.</p> |





## Usage Precautions

### (1) Typical values for input signals

| Pin no.     | Pin name             | Specifications  |
|-------------|----------------------|---|
| ②           | C.Sync IN            |   |
| ⑨           | VIDEO IN             | <p>VIDEO IN If there is no input, this should always be set to the Free Run mode.</p> |
| ⑩           | Ys                   |   |
| ⑮<br>⑰<br>⑱ | B IN<br>G IN<br>R IN |   |

### (2) Setting the Free Run frequency

This IC generates the fsc by means of the VCXO circuit.

Consequently, the VCXO oscillation frequency must always be set to fsc before the IC is used, by following the procedure outlined below.

1. Connect [9] (VIDEO IN) to GND, and set the Free Run mode.
2. Set the [2] (OFFSET R) voltage when SYNC was input to [4] (C. SYNC IN) to  $V_4$ , and apply a voltage of  $V_4 = 0.5$  V to [4] (OFFSET R).
3. Fix C.[2] (SYNC IN) in the High state. (5 V applied)
4. Adjust the output frequency of [5] (TRAP) to the trimmer capacitor of [7] (VCXO IN), and set it to fsc.

**(3) Setting the color difference LPF**

The frequency characteristic of the color difference LPF built into this IC can be set as shown in Fig. 1, using the [20] (fc CONT.) external resistor.

When doing this, the group delay characteristic also changes, as shown in Fig. 2.

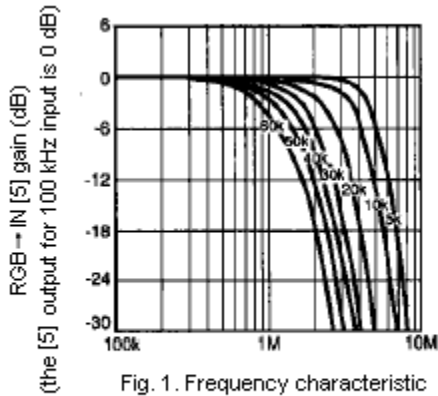


Fig. 1. Frequency characteristic of the color difference LPF (for measurement conditions, see TEST nos. 14 and 15)

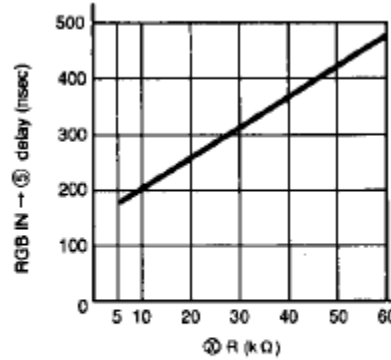


Fig. 2. Group delay characteristic for the color difference LPF (for measurement conditions, see TEST nos. 14 and 15)

**(4) Setting Y DL**

The group delay characteristic of the color signal of the RGB encoder output changes in response to the [20] (fc CONT) external resistor, so Y DL should be set in such a way that the group delay characteristic is the amount of group delay obtained from the group delay characteristic of Fig. 2, with 40 ns added.

Also, if the [6] (TRAP) circuit is being added, a further delay of +5 to +10 ns should be taken into consideration.

**(5) COLOR CONT characteristic**

The gain of the chroma unit can be set as shown in Fig. 3, using the [19] (COLOR CONT) applied voltage. (The burst amplitude is constant.)

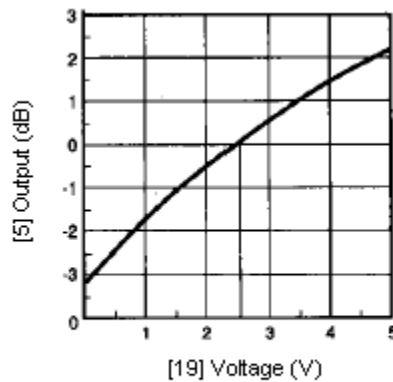


Fig. 3. COLOR CONT characteristic (for measurement conditions, see TEST nos. 16, 17, 18, and 19)

**(6) The relationship between BFP and HHK**

The pulse width of BFP and HHK can be set as shown in Fig. 4, using the [3] (HHK) external CR.

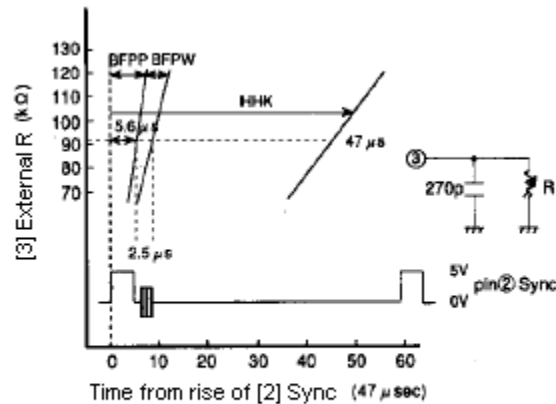
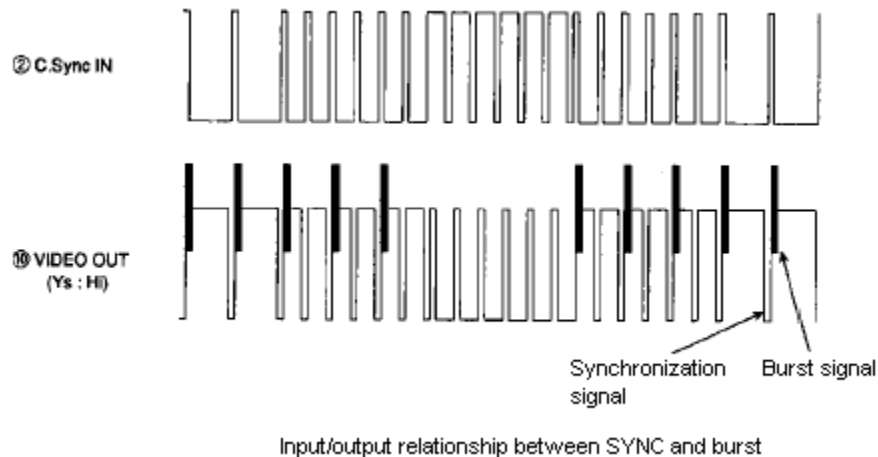


Fig. 4. [3] RC product versus pulse generated internally  
(for measurement conditions, see TEST nos. 35, 36, and 37)

**(7) Input pin drive**

Input pins [9], [16], [17], and [18] use clamp input, so they should always be driven with a low impedance.

**(8) Input/output relationship between SYNC and burst during the V cycle****(9) V DL and Y<sub>S</sub> DL settings when the SUPERIMPOSE mode is being used**

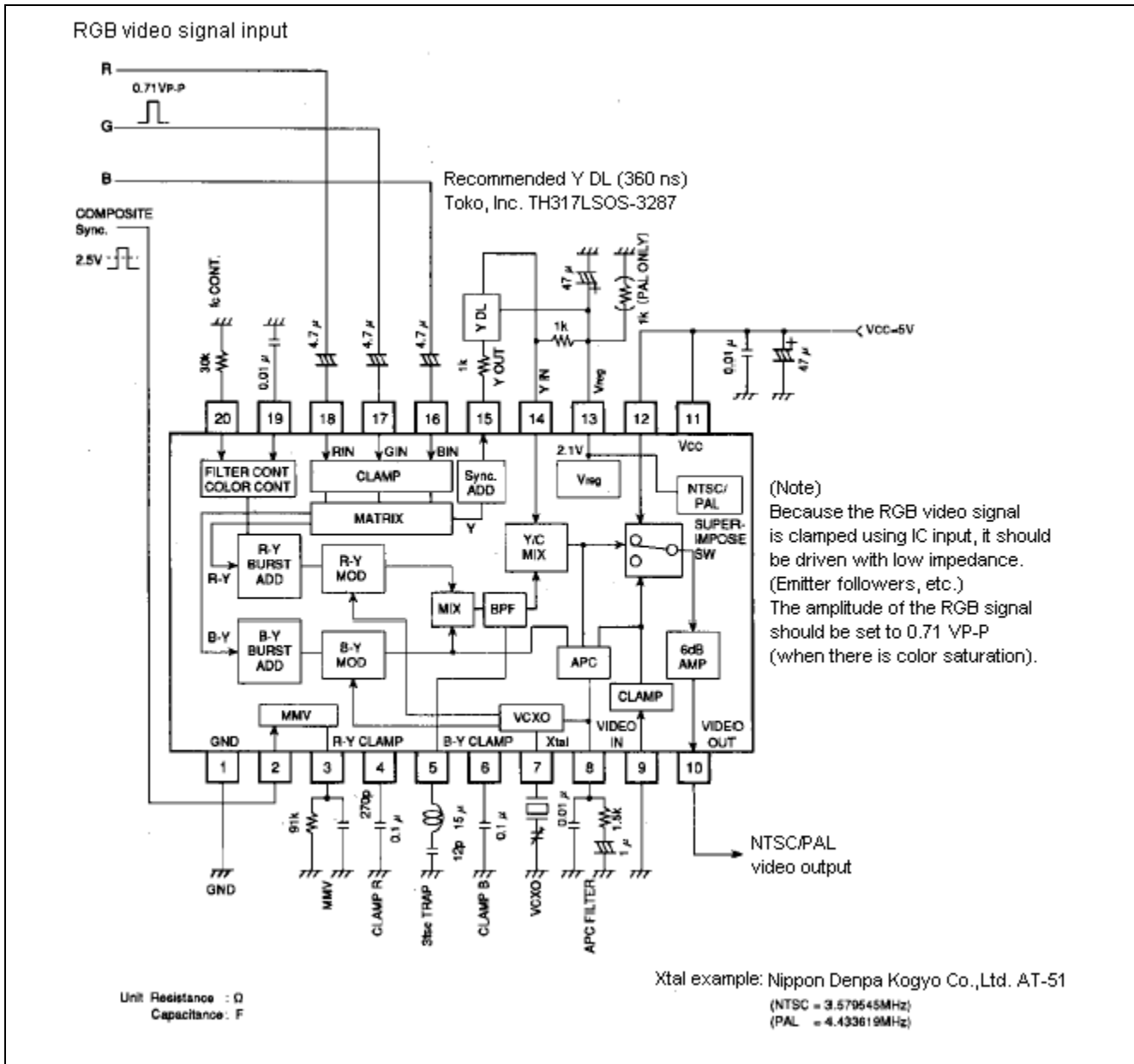
- 1) V DL is used to adjust the timing of the RGB encoder signal and the VIDEO IN signal.
- 2) Y<sub>S</sub> DL is used to adjust the timing of the RGB encoder signal and the Y<sub>S</sub> IN signal.
- 3) When the timing is the same for C. SYNC IN, RGB IN, VIDEO IN and Y<sub>S</sub> IN, V DL and Y<sub>S</sub> DL should be set using the amount of delay shown below as a guide.

$$V DL = Y DL (\text{item 4}) + 10 (\text{ns})$$

$$Y_S DL = Y DL - 10 (\text{ns})$$

### Application Example (1)

Example showing RGB video signals being encoded in NTSC/PAL signal

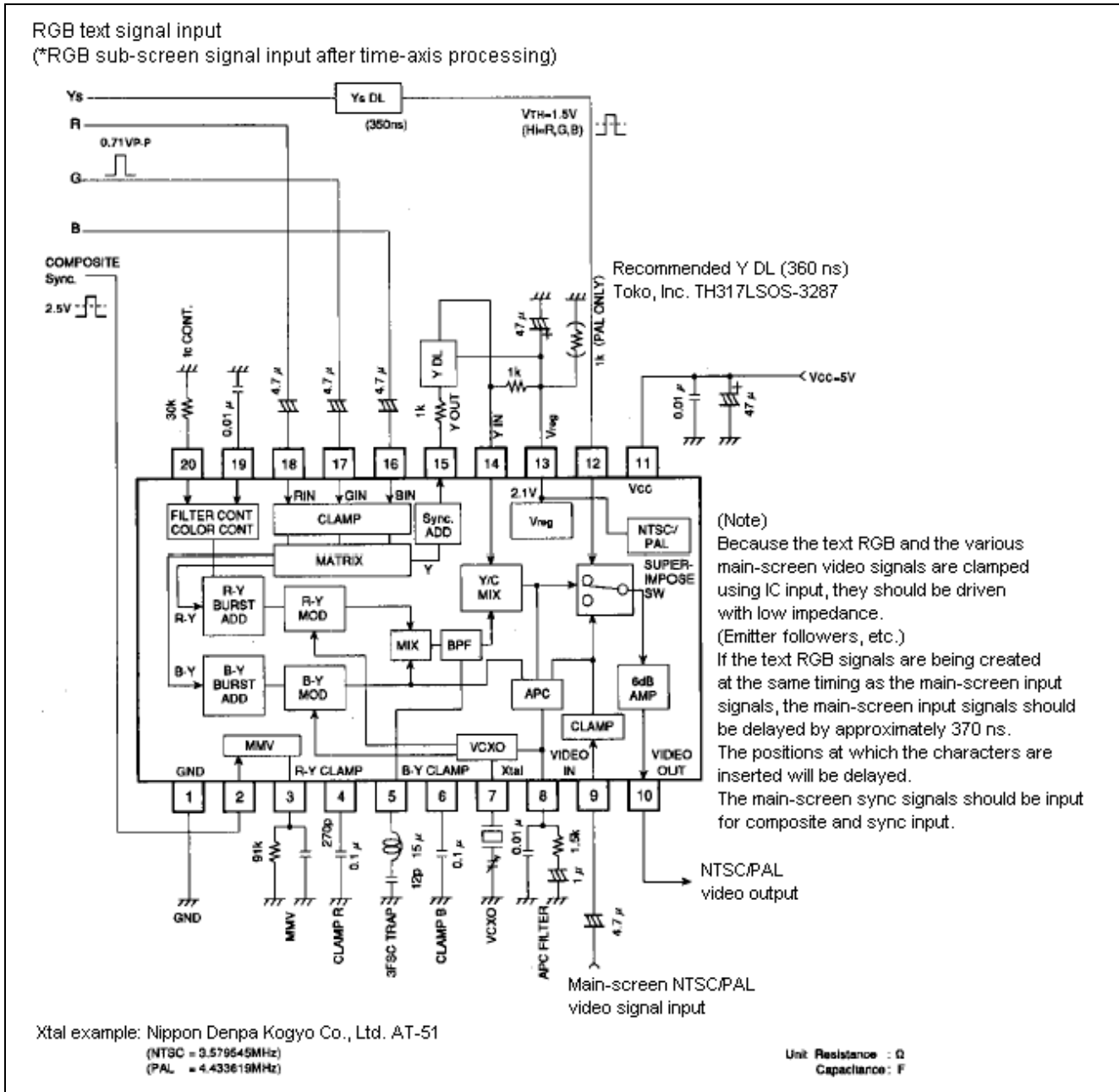


## Application Example (2)

Example showing RGB text signals superimposed on NTSC/PAL signals

(\*The values in brackets show what takes place when the RGB signals of a personal computer or other device are superimposed on NTSC/PAL signals as a sub-screen.)

If signals delayed by approximately 350 ns after the text (\*sub-screen) RGB signals are created directly, as Ys signals, Ys DL is not necessary. If RGB and Ys are at same timing, the delay time of Ys DL should be set to 350 ns (typical).



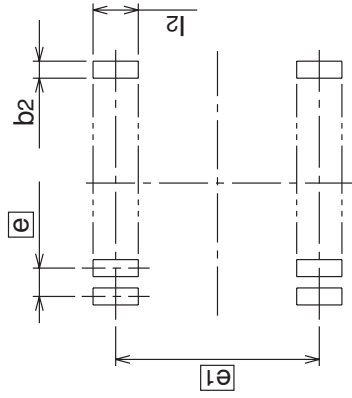
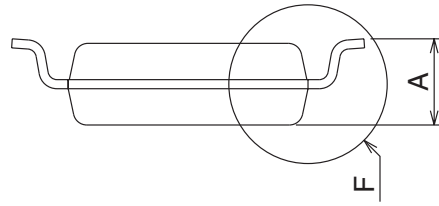
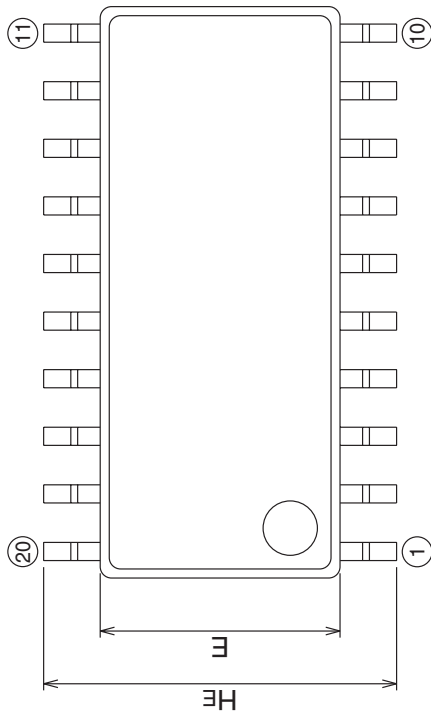
Package Dimensions

**20P2N-A**

(MMP)

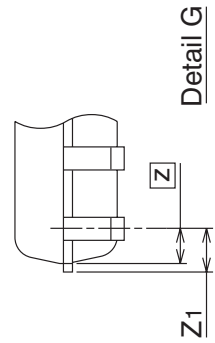
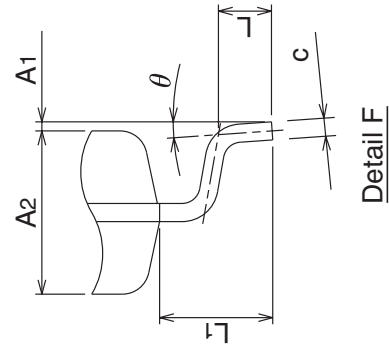
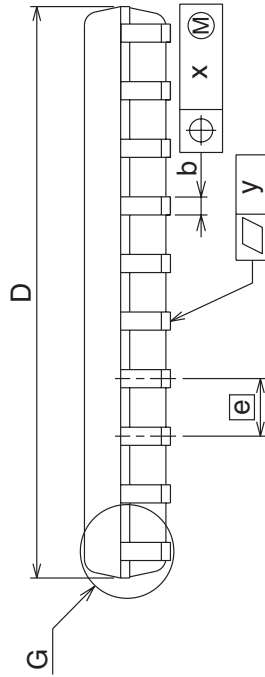
**Plastic 20pin 300mil SOP**

|                                       |                 |                   |                           |
|---------------------------------------|-----------------|-------------------|---------------------------|
| EIAJ Package Code<br>SOP20-P-300-1.27 | JEDEC Code<br>— | Weight(g)<br>0.26 | Lead Material<br>Cu Alloy |
|---------------------------------------|-----------------|-------------------|---------------------------|



Recommended Mount Pad

| Symbol | Dimension in Millimeters |       |       |
|--------|--------------------------|-------|-------|
|        | Min                      | Nom   | Max   |
| A      | —                        | —     | 2.1   |
| A1     | 0                        | 0.1   | 0.2   |
| A2     | —                        | 1.8   | —     |
| b      | 0.35                     | 0.4   | 0.5   |
| c      | 0.18                     | 0.2   | 0.25  |
| D      | 12.5                     | 12.6  | 12.7  |
| E      | 5.2                      | 5.3   | 5.4   |
| e      | —                        | 1.27  | —     |
| HE     | 7.5                      | 7.8   | 8.1   |
| L      | 0.4                      | 0.6   | 0.8   |
| L1     | —                        | 1.25  | —     |
| Z      | —                        | 0.585 | —     |
| Z1     | —                        | —     | 0.735 |
| x      | —                        | —     | 0.25  |
| y      | —                        | —     | 0.1   |
| θ      | 0°                       | —     | 8°    |
| b2     | —                        | 0.76  | —     |
| e1     | —                        | 7.62  | —     |
| l2     | 1.27                     | —     | —     |



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