

# AN2527NFHP

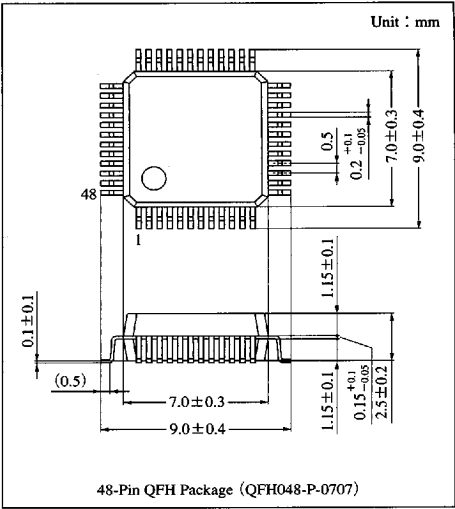
## Signal Processor for IC Color LCD

### Overview

The AN2527NFHP is a signal processor IC for video camera with a color-LCD. It alternates RGB components of a video signal at intervals of 1H. It is for 12 to 14V LCD panel.

### Features

- Compatible with NTSC and PAL
- Built-in color-character insertion circuit
- Responding to composite and component signal processing
- Built-in a  $\gamma$  correction circuit



### Absolute Maximum Ratings (Ta = 25 °C)

| Parameter                                        | Symbol           | Rating      | Unit |
|--------------------------------------------------|------------------|-------------|------|
| Supply voltage                                   | V <sub>CC1</sub> | 5.5         | V    |
|                                                  | V <sub>CC2</sub> | 15.5        |      |
| Power dissipation <sup>Note 2)</sup>             | P <sub>D</sub>   | 209         | mW   |
| Operating ambient temperature <sup>Note 1)</sup> | T <sub>opr</sub> | -20 to +70  | °C   |
| Storage temperature <sup>Note 1)</sup>           | T <sub>stg</sub> | -55 to +125 | °C   |

Note 1) Ta = 25°C except operating ambient temperature and storage temperatures unless otherwise specified.

Note 2) Allowable power dissipation of the package at Ta = 70°C.

### Recommended Operating Range (Ta = 25°C)

| Parameter                      | Symbol           | Range          |
|--------------------------------|------------------|----------------|
| Operating supply voltage range | V <sub>CC1</sub> | 4.5V to 5.1V   |
|                                | V <sub>CC2</sub> | 11.5V to 15.3V |

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## ICs for Video Camera

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■ Electrical Characteristics (Ta=25±2℃)

| Parameter                                 | Symbol             | Condition                                                          | min   | typ  | max  | Unit              |
|-------------------------------------------|--------------------|--------------------------------------------------------------------|-------|------|------|-------------------|
| Circuit current (4.8V system)             | I <sub>57</sub>    | V <sub>CC1</sub> =4.8V, V <sub>CC2</sub> =15V                      | 19    | 24   | 29   | mA                |
| Circuit current (15V system)              | I <sub>18</sub>    | V <sub>CC1</sub> =4.8V, V <sub>CC2</sub> =15V                      | 1     | 3    | 6    | mA                |
| APC pull-in (Hi)                          | AP <sub>H</sub>    | V <sub>CC1</sub> =4.8V, V <sub>CC2</sub> =15V                      | 0.5   | —    | —    | kHz               |
| APC pull-in (Low)                         | AP <sub>L</sub>    | V <sub>CC1</sub> =4.8V, V <sub>CC2</sub> =15V                      | —     | —    | -0.5 | kHz               |
| ACC output characteristics                | AC <sub>41</sub>   | Input=600mV <sub>P-P</sub>                                         | 300   | 500  | 700  | mV <sub>P-P</sub> |
| ACC control characteristics               | AG <sub>23</sub>   | Input=600mV <sub>P-P</sub>                                         | 5.0   | 8.0  | 11.0 | dB                |
| TINT control sensitivity                  | TI <sub>3</sub>    | V <sub>3</sub> =1.0/2.0V                                           | 100   | 350  | 600  | mV <sub>P-P</sub> |
| Killer characteristics                    | VK <sub>45</sub>   | V <sub>CC1</sub> =4.8V, V <sub>CC2</sub> =15V                      | —     | —    | 50   | mV <sub>P-P</sub> |
| Chroma leak (in case of killer-on)        | L <sub>K</sub>     | V <sub>CC1</sub> =4.8V, V <sub>CC2</sub> =15V                      | —     | —    | -20  | dB                |
| SYNC output amplitude                     | V <sub>33</sub>    | Input=1.0V <sub>P-P</sub>                                          | 4.0   | —    | —    | V <sub>P-P</sub>  |
| Minimum synchronous separation capability | MS <sub>33</sub>   | Input=1.0V <sub>P-P</sub>                                          | —     | —    | 80   | mV <sub>P-P</sub> |
| Y contrast adjustment                     | YC <sub>30</sub>   | V <sub>30</sub> =1.5/2.5V                                          | 3.7   | 5.7  | 7.7  | dB                |
| Sharpness adjustment                      | SH <sub>31</sub>   | Input=1.0V <sub>P-P</sub>                                          | 3     | 6    | 9.0  | dB                |
| Character level threshold (M)             | V <sub>T(M)</sub>  | V <sub>CC1</sub> =4.8V, V <sub>CC2</sub> =15V                      | 1.3   | 1.6  | 1.9  | V                 |
| Character level threshold (H)             | V <sub>T(H)</sub>  | V <sub>CC1</sub> =4.8V, V <sub>CC2</sub> =15V                      | 2.7   | 3.0  | 3.3  | V                 |
| DL threshold (M)                          | V <sub>DM</sub>    | V <sub>CC1</sub> =4.8V, V <sub>CC2</sub> =15V                      | 1.3   | 1.6  | 1.9  | V                 |
| DL threshold (H)                          | V <sub>DH</sub>    | V <sub>CC1</sub> =4.8V, V <sub>CC2</sub> =15V                      | 2.7   | 3.0  | 3.3  | V                 |
| Contrast (G ch)                           | CG <sub>26</sub>   | Input=1.0V <sub>P-P</sub>                                          | 3.0   | 4.0  | 5.0  | dB                |
| Sub-contrast (R ch)                       | SR <sub>27</sub>   | Input=1.0V <sub>P-P</sub>                                          | 1.0   | 2.0  | 3.0  | dB                |
| Sub-contrast (B ch)                       | SB <sub>25</sub>   | Input=1.0V <sub>P-P</sub>                                          | 1.0   | 2.0  | 3.0  | dB                |
| γ characteristics (1)                     | γ <sub>11A</sub>   | Input=1.0V <sub>P-P</sub>                                          | 5.0   | 7.5  | 10.0 | dB                |
| γ characteristics (2)                     | γ <sub>11B</sub>   | Input=1.0V <sub>P-P</sub>                                          | 3.0   | 5.5  | 8.0  | dB                |
| Brightness variable range (Lo)            | BR <sub>7(L)</sub> | Input=1.0V <sub>P-P</sub> , V <sub>7</sub> =0V                     | —     | —    | 1.7  | V                 |
| Brightness variable range (Hi)            | BR <sub>7(H)</sub> | Input=1.0V <sub>P-P</sub> , V <sub>7</sub> =4.8V                   | 2.8   | —    | —    | V                 |
| White balance adjustment Lo               | WB <sub>L</sub>    | Input=1.0V <sub>P-P</sub> , V <sub>8</sub> , V <sub>10</sub> =0V   | —     | —    | 1.9  | V                 |
| White balance adjustment Hi               | WB <sub>H</sub>    | Input=1.0V <sub>P-P</sub> , V <sub>8</sub> , V <sub>10</sub> =4.8V | 2.1   | —    | —    | V                 |
| Output signal limiter level (Black side)  | V <sub>RL(B)</sub> | Input=1.0V <sub>P-P</sub> , V <sub>11</sub> =0V                    | 1.0   | 1.3  | 1.6  | V                 |
| Output signal limiter level (White side)  | V <sub>RL(W)</sub> | Input=1.0V <sub>P-P</sub> , V <sub>11</sub> =4.8V                  | 13.0  | 13.7 | 14.4 | V                 |
| Output terminal absolute voltage (R ch)   | V                  | Input=1.0V <sub>P-P</sub>                                          | 7.25  | 7.5  | 7.75 | V                 |
| Output terminal absolute voltage (G ch)   | V <sub>17A</sub>   | Input=1.0V <sub>P-P</sub>                                          | 7.25  | 7.5  | 7.75 | V                 |
| Output terminal absolute voltage (B ch)   | V <sub>15A</sub>   | Input=1.0V <sub>P-P</sub>                                          | 7.25  | 7.5  | 7.75 | V                 |
| Output terminal relative voltage (R ch)   | V <sub>19B</sub>   | Input=1.0V <sub>P-P</sub>                                          | -0.25 | 0    | 0.25 | V                 |
| Output terminal relative voltage (B ch)   | V <sub>15B</sub>   | Input=1.0V <sub>P-P</sub>                                          | -0.25 | 0    | 0.25 | V                 |

■ Electrical Characteristics [for reference only] (Ta=25±2℃)

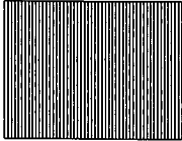
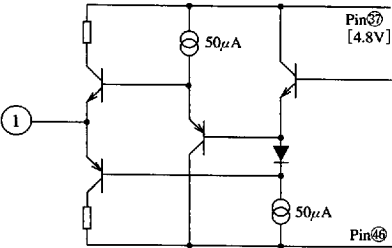
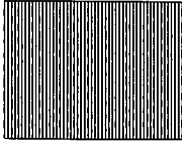
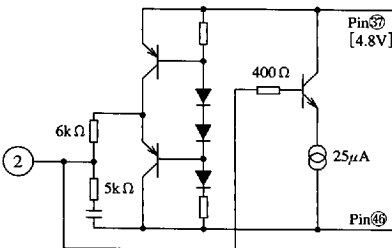
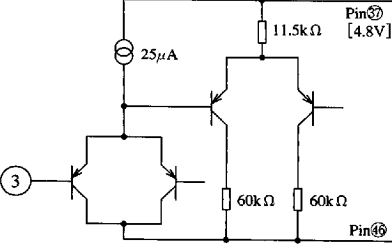
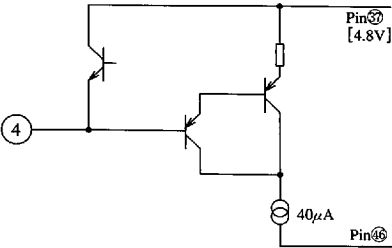
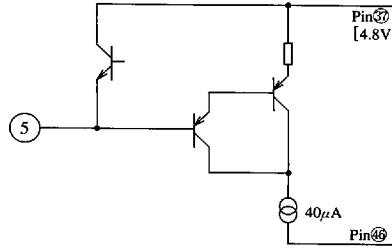
| Parameter                    | Symbol             | Condition                  | min | typ | max | Unit |
|------------------------------|--------------------|----------------------------|-----|-----|-----|------|
| Y→G signal gain              | G <sub>17-39</sub> | Input=1.0V <sub>P-P</sub>  | —   | 13  | —   | dB   |
| C→R signal gain              | GN <sub>19</sub>   | Input=600mV <sub>P-P</sub> | —   | 15  | —   | dB   |
| C→G signal gain              | GN <sub>17</sub>   | Input=600mV <sub>P-P</sub> | —   | 10  | —   | dB   |
| C→B signal gain              | GN <sub>15</sub>   | Input=600mV <sub>P-P</sub> | —   | 16  | —   | dB   |
| Y→G signal f characteristics | F <sub>17-39</sub> | Input=1.0V <sub>P-P</sub>  | —   | -6  | —   | dB   |
| G ch character level (Lo)    | CG <sub>L</sub>    | Input=1.0V <sub>P-P</sub>  | —   | 5   | —   | IRE  |
| G ch character level (Hi)    | CG <sub>H</sub>    | Input=1.0V <sub>P-P</sub>  | —   | 85  | —   | IRE  |

Note) The value in the above characteristics is not a guaranteed value, but reference one on design.

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Pin Descriptions

| Pin No. | Pin name  | Waveform                                                                                                         | Description                                                                                                                                  | Equivalent circuit                                                                   |
|---------|-----------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 1       | XTAL 1    | NTSC 3.58MHz<br>PAL 4.43MHz<br> | <ul style="list-style-type: none"><li>To a XTAL</li><li>Forming a pair of input terminals with Pin②</li></ul>                                |    |
| 2       | XTAL 2    | NTSC 3.58MHz<br>PAL 4.43MHz<br> | <ul style="list-style-type: none"><li>To a XTAL</li><li>Forming a pair of input terminals with Pin①</li></ul>                                |    |
| 3       | TINT      |                                 | <ul style="list-style-type: none"><li>TINT control input<br/>H (more than 2.5V) : PAL<br/>L (up to 2.5V) : NTSC</li></ul>                    |   |
| 4       | B-Y CLAMP | 0.1µF                                                                                                            | <ul style="list-style-type: none"><li>To a B-Y clamp capacitor</li><li>H.SYNC pulse clamps the B-Y signal to the reference voltage</li></ul> |  |
| 5       | R-Y CLAMP | 0.1µF                                                                                                            | <ul style="list-style-type: none"><li>To a R-Y clamp capacitor</li><li>H.SYNC pulse clamps the R-Y signal to the reference voltage</li></ul> |  |

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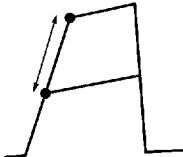
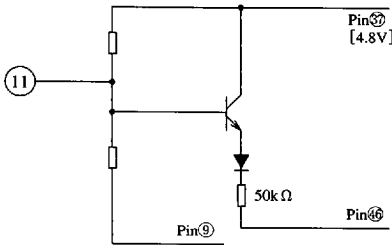
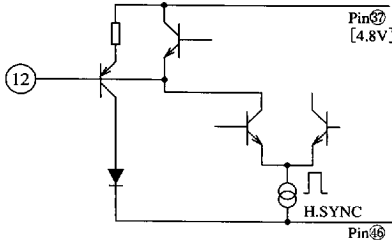
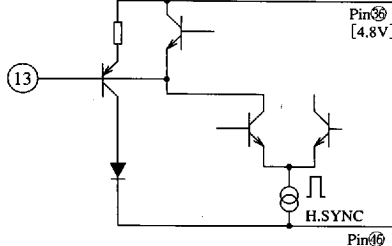
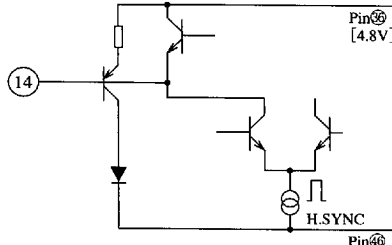
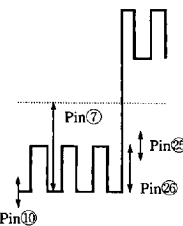
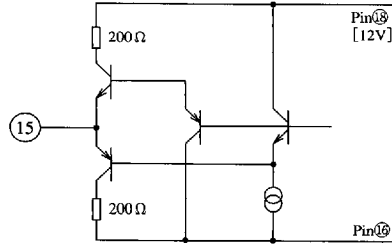
# Pin Descriptions (cont.)

| Pin No. | Pin name  | Waveform    | Description                                                                                                                                                    | Equivalent circuit |
|---------|-----------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| 6       | G-Y CLAMP | 0.1 $\mu$ F | <ul style="list-style-type: none"> <li>To a R-Y clamp capacitor</li> <li>H.SYNC pulse clamps the G-Y signal to the reference voltage</li> </ul>                |                    |
| 7       | BRIGHT    |             | <ul style="list-style-type: none"> <li>Brightness control</li> <li>Used to control the pedestal level of R, G, and B outputs at the same time</li> </ul>       |                    |
| 8       | WB-R      |             | <ul style="list-style-type: none"> <li>R-output white balance control</li> <li>Used to fine-control the pedestal level of R output</li> <li>2V typ.</li> </ul> |                    |
| 9       | VREF      |             | <ul style="list-style-type: none"> <li>Reference voltage output</li> <li>2V typ.</li> </ul>                                                                    |                    |
| 10      | WB-B      |             | <ul style="list-style-type: none"> <li>B-output white balance control</li> <li>Used to fine-control the pedestal level of B output</li> <li>2V typ.</li> </ul> |                    |

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■ Pin Descriptions (cont.)

| Pin No. | Pin name      | Waveform                                                                            | Description                                                                                                                                                                             | Equivalent circuit                                                                   |
|---------|---------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 11      | $\gamma$ CONT |    | <ul style="list-style-type: none"><li>· <math>\gamma</math> characteristics control</li><li>· Used to control the <math>\gamma</math>-curve knee point of R, G, and B outputs</li></ul> |    |
| 12      | B CLAMP       |    | <ul style="list-style-type: none"><li>· To a B-signal clamp capacitor</li><li>· 0.1 <math>\mu</math>F typ.</li></ul>                                                                    |    |
| 13      | G CLAMP       |    | <ul style="list-style-type: none"><li>· To a G-signal clamp capacitor</li><li>· 0.1 <math>\mu</math>F typ.</li></ul>                                                                    |   |
| 14      | R CLAMP       |  | <ul style="list-style-type: none"><li>· To a R-signal clamp capacitor</li><li>· 0.1 <math>\mu</math>F typ.</li></ul>                                                                    |  |
| 15      | B OUT         |  | <ul style="list-style-type: none"><li>· B-signal output</li><li>· 70-<math>\Omega</math> output impedance</li></ul>                                                                     |  |

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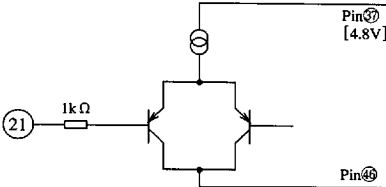
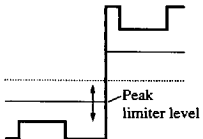
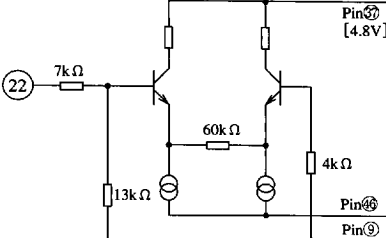
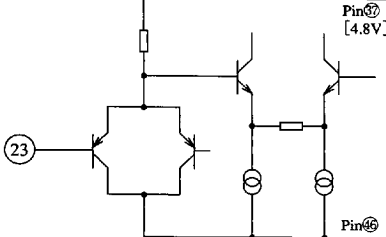
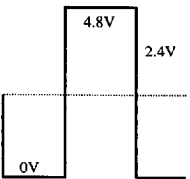
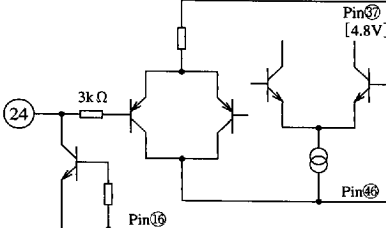
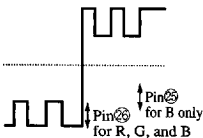
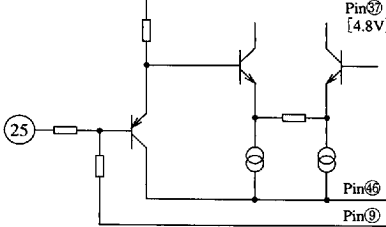
# Pin Descriptions (cont.)

| Pin No. | Pin name  | Waveform | Description                                                                                                                                                                                                                                              | Equivalent circuit |
|---------|-----------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| 16      | GND2      |          | <ul style="list-style-type: none"> <li>Ground for the <math>V_{CC2}</math> (12V) subsystem</li> </ul>                                                                                                                                                    |                    |
| 17      | G OUT     |          | <ul style="list-style-type: none"> <li>G-signal output</li> <li>70-<math>\Omega</math> output impedance</li> </ul>                                                                                                                                       |                    |
| 18      | $V_{CC2}$ |          | <ul style="list-style-type: none"> <li>12V power supply input</li> <li>Typ. 4mA current consumption</li> </ul>                                                                                                                                           |                    |
| 19      | R OUT     |          | <ul style="list-style-type: none"> <li>R-signal output</li> <li>70-<math>\Omega</math> output impedance</li> </ul>                                                                                                                                       |                    |
| 20      | DC Det.   |          | <ul style="list-style-type: none"> <li>R, G, B output DC voltage stabilizing capacitor pin</li> <li>Used to adjust the center level of G output (and thereby R and B outputs) to <math>1/2 V_{CC2}</math></li> <li>0.1 <math>\mu</math>F typ.</li> </ul> |                    |

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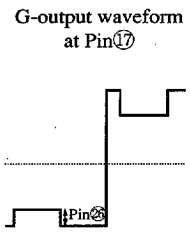
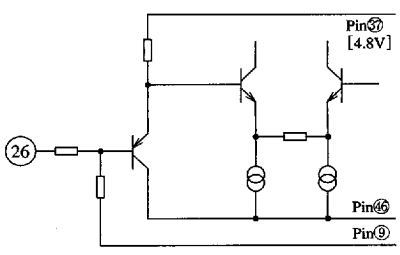
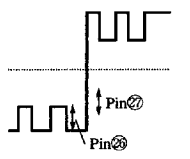
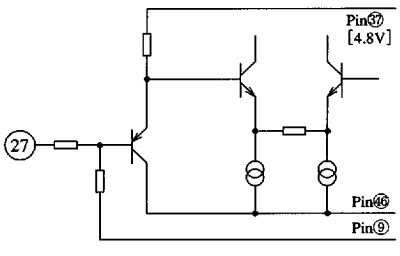
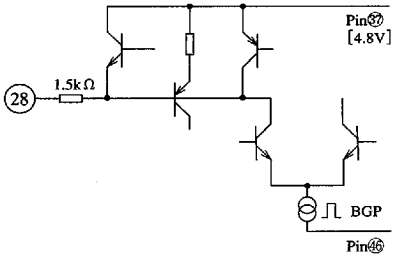
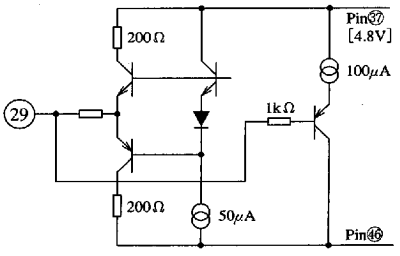
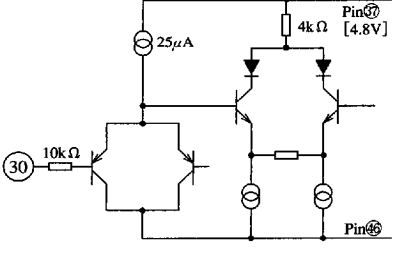
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Pin Descriptions (cont.)

| Pin No. | Pin name    | Waveform                                                                            | Description                                                                                                                                                                    | Equivalent circuit                                                                   |
|---------|-------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 21      | DL SW       |    | <ul style="list-style-type: none"><li>• Delay switch</li><li>• Used to switch the delay of R and B signals with respect to G signal</li></ul>                                  |    |
| 22      | PEAK LIM    |    | <ul style="list-style-type: none"><li>• Peak limiter level control</li><li>• Used to control the peak limiter level of R, G, and B output signals</li></ul>                    |    |
| 23      | ACC CONT    |    | <ul style="list-style-type: none"><li>• ACC output amplitude control</li><li>• Used to control the level of ACC output amplitude</li><li>• <math>V_{REF}</math> typ.</li></ul> |   |
| 24      | HT PULSE IN |  | <ul style="list-style-type: none"><li>• HT pulse input</li><li>• R, G, and B signals synchronized with HT pulse are outputted</li></ul>                                        |  |
| 25      | SUB CONT -B |  | <ul style="list-style-type: none"><li>• B-output signal subcontrast control</li><li>• Used to fine-control B-output signal contrast</li><li>• 1.8V typ.</li></ul>              |  |

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■ Pin Descriptions (cont.)

| Pin No. | Pin name   | Waveform                                                                            | Description                                                                                                                                                                                                               | Equivalent circuit                                                                   |
|---------|------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 26      | CONTRAST   |    | <ul style="list-style-type: none"><li>• Contrast control</li><li>• Used to control the contrast of R, G, and B output signals at same time</li></ul>                                                                      |    |
| 27      | SUB CONT-R |    | <ul style="list-style-type: none"><li>• Used to fine-control R-output signal contrast</li><li>• 1.8V typ.</li></ul>                                                                                                       |    |
| 28      | Y-CLAMP    |    | <ul style="list-style-type: none"><li>• To a Y-signal clamp capacitor</li><li>• 0.1 <math>\mu</math>F typ.</li></ul>                                                                                                      |   |
| 29      | FSP TRAP   |  | <ul style="list-style-type: none"><li>• To FSC trap network</li><li>• Not used for component signals</li><li>• For NTSC, C=47pF and L=35 <math>\mu</math>H</li><li>• For PAL, C=47pF and L=27 <math>\mu</math>H</li></ul> |  |
| 30      | Y-CONT     |  | <ul style="list-style-type: none"><li>• Y-signal amplitude control</li><li>• Used to control the amplitude of Y signal which is mixed with R-Y, B-Y, and G-Y</li><li>• <math>V_{REF}</math> typ.</li></ul>                |  |

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Pin Descriptions (cont.)

| Pin No. | Pin name         | Waveform | Description                                                                                                                                                                                                            | Equivalent circuit |
|---------|------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| 31      | H-AP GAIN        |          | <ul style="list-style-type: none"><li>• H-AP signal amplitude adjust</li><li>• H-AP signals are amplified, and then mixed with Y signals, and luminance signals are generated</li><li>• V<sub>REF</sub> typ.</li></ul> |                    |
| 32      | BGP              |          | <ul style="list-style-type: none"><li>• To a BG pulse generating CR network</li><li>• Delay is determined by C and R</li></ul>                                                                                         |                    |
| 33      | H-SYNC OUT       |          | <ul style="list-style-type: none"><li>• H.SYNC pulse output</li><li>• H.SYNC is separated from the signal which is input at Pin 33, and is output</li></ul>                                                            |                    |
| 34      | CHA PULSE IN (R) |          | <ul style="list-style-type: none"><li>• Character pulse (R) input</li><li>• Character with black-frame can be outputted at Pin 19 of R-output by character pulse input</li></ul>                                       |                    |
| 35      | CHA PULSE IN (G) |          | <ul style="list-style-type: none"><li>• Character pulse (G) input</li><li>• Character with black frame can be outputted at Pin 17 of G-output</li></ul>                                                                |                    |

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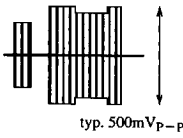
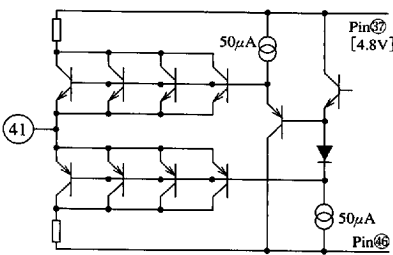
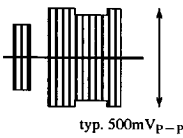
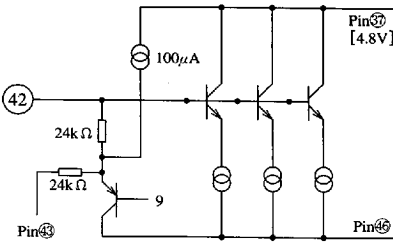
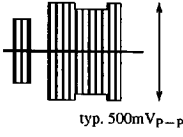
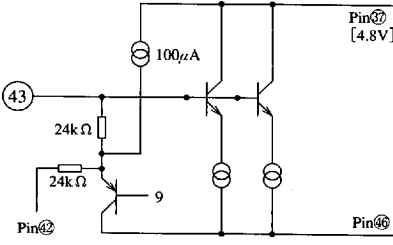
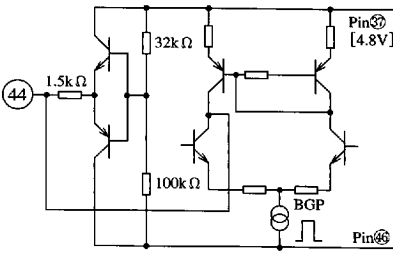
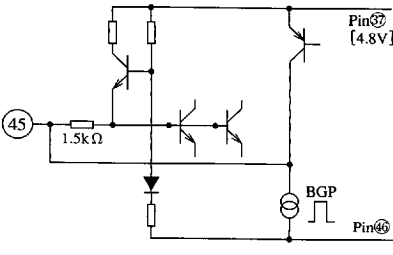
# Pin Descriptions (cont.)

| Pin No. | Pin name                | Waveform                                   | Description                                                                                                                                 | Equivalent circuit |
|---------|-------------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| 36      | CHA PULSE IN (B)        |                                            | <ul style="list-style-type: none"> <li>Character with black-frame can be outputted at G-output by character pulse (B) input-Pin⑬</li> </ul> |                    |
| 37      | V <sub>CC1</sub> (4.8V) |                                            | <ul style="list-style-type: none"> <li>4.8V power supply input</li> <li>20mA typ. current consumption</li> </ul>                            |                    |
| 38      | HSYNC IN                | <p>Input signal example : video signal</p> | <ul style="list-style-type: none"> <li>H.SYNC input</li> <li>Input composite video signal</li> </ul>                                        |                    |
| 39      | Y IN                    | <p>Input signal example : video signal</p> | <ul style="list-style-type: none"> <li>Luminance signal input</li> <li>Input composite video signal</li> </ul>                              |                    |
| 40      | C IN                    | <p>Input signal example : video signal</p> | <ul style="list-style-type: none"> <li>Chroma input</li> <li>Input composite video signal</li> </ul>                                        |                    |

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■ Pin Descriptions (cont.)

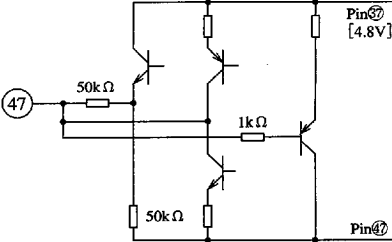
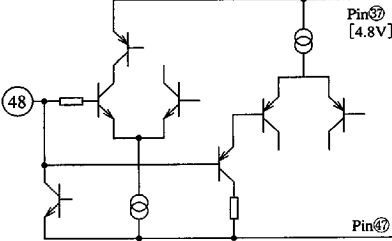
| Pin No. | Pin name    | Waveform                                                                                                                                                           | Description                                                                                                                                                                                                                                                 | Equivalent circuit                                                                   |
|---------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| 41      | ACC OUT     | <p>Output waveform<br/>3.58MHz<br/>(4.43MHz)</p>  <p>typ. 500mV<sub>p-p</sub></p> | <ul style="list-style-type: none"><li>· Chroma output through ACC</li><li>· After being processed in ACC, input chroma signal of Pin④① is outputted.</li><li>· The output amplitude can be adjusted at Pin ②③.</li><li>· 500mV<sub>p-p</sub> typ.</li></ul> |    |
| 42      | 2B+Burst    | <p>Input waveform<br/>(simplified PAL)</p>  <p>typ. 500mV<sub>p-p</sub></p>       | <ul style="list-style-type: none"><li>· 2B+Burst input</li><li>· For simplified PAL, ACC OUT of Pin④① is inputted to this pin.</li></ul>                                                                                                                    |    |
| 43      | 2R          | <p>Input waveform<br/>(simplified PAL)</p>  <p>typ. 500mV<sub>p-p</sub></p>      | <ul style="list-style-type: none"><li>· 2R input</li><li>· For simplified PAL, ACC OUT of Pin④① is inputted to this pin.</li></ul>                                                                                                                          |   |
| 44      | ACC Det.    | <p>0.1 μF</p>                                                                                                                                                      | <ul style="list-style-type: none"><li>· To an ACC capacitor</li><li>· Used for automatic adjustment of burst signal amplitudes</li></ul>                                                                                                                    |  |
| 45      | KILLER Det. | <p>0.1 μF</p>                                                                                                                                                      | <ul style="list-style-type: none"><li>· To a KILLER capacitor</li><li>· Used to cut chroma signals, and produce monochrome images for preventing the image-deterioration, when burst signal amplitude is low</li></ul>                                      |  |

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■ Pin Descriptions (cont.)

| Pin No. | Pin name | Waveform                                                                          | Description                                                                                       | Equivalent circuit                                                                  |
|---------|----------|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 46      | GND1     |  | • Ground for V <sub>CC1</sub> system (4.8V)                                                       |   |
| 47      | APC Det. | 0.1 μF                                                                            | • To APC capacitor<br>• Used to match the phase of crystal oscillation with that of burst signals |   |
| 48      | HALF H   |  | • To CR network for HALF H. KILLER<br>• Used for HALF H operation when PAL signals are inputted   |  |

■ Reference

