

AN5367FB

NTSC video, chroma, and deflection signal processing circuit

■ Overview

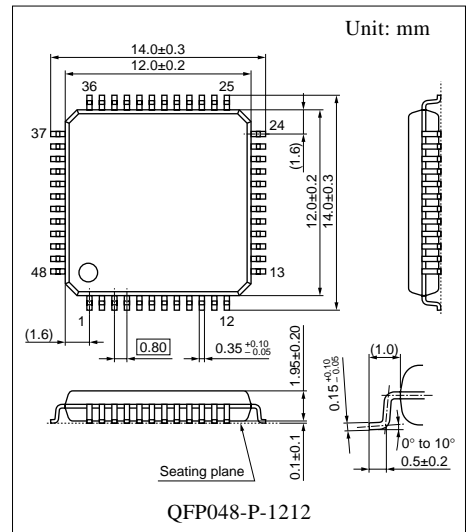
The AN5367FB is an IC to demodulate the NTSC composite signal. It is possible to control the all functions by the I²C bus. The use of flat package allows a space saving in sets design.

■ Features

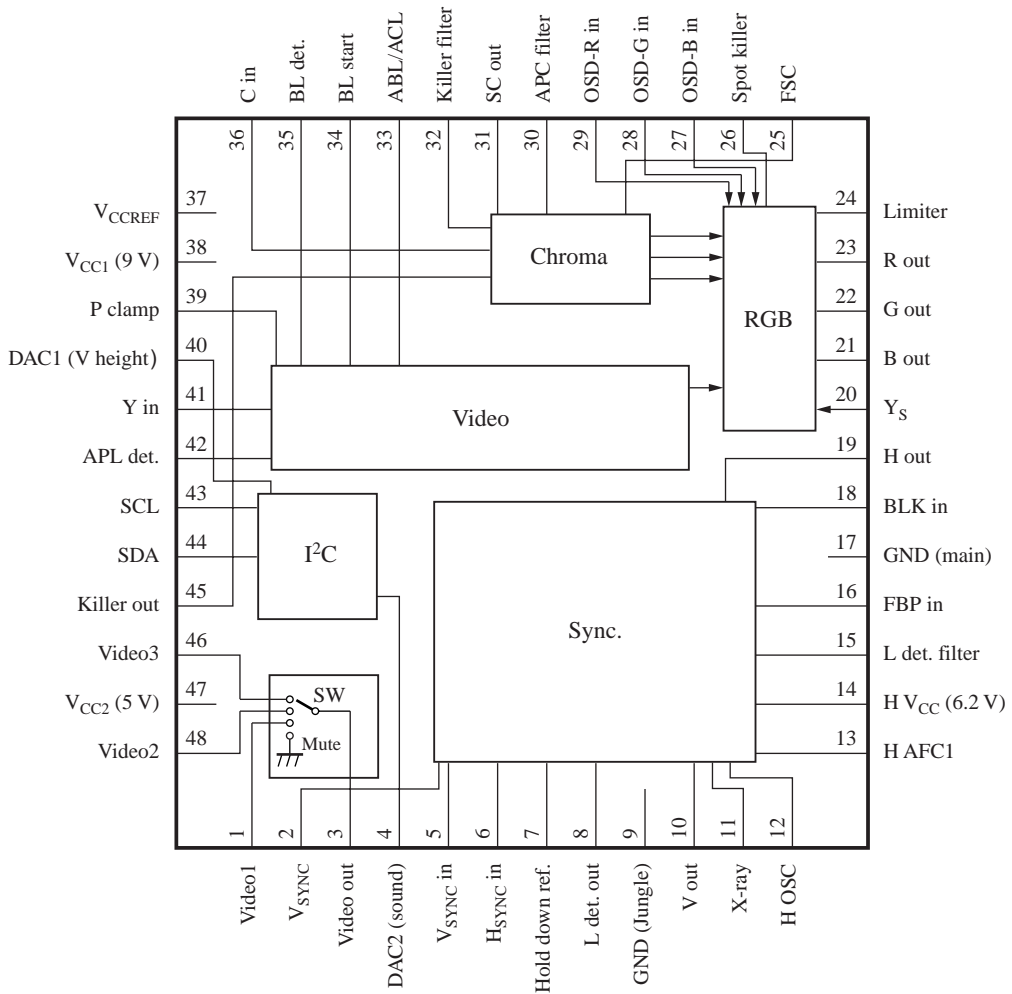
- Luminance signal processing
 - Incorporating 3.58 MHz trap
 - Black side gradation control is possible by black expansion circuit
 - Adopting delay line aperture control
- Color signal processing
 - Incorporating band-pass filter
 - Incorporating ACC filter
- Deflection signal processing
 - Stable sync. signal generation by the use of double AFC circuit and countdown circuit
 - Vertical directional screen position is adjustable
- Others
 - Incorporating 3-input composite signal changeover SW
 - DAC output for adjusting sound volume and screen height

■ Applications

- Color televisions and combined CTV/VCR set



■ Block Diagram



■ Pin Descriptions

| Pin No. | Description | Pin No. | Description |
|---------|---------------------------------------|---------|--|
| 1 | Video signal input pin 1 | 11 | Hold down input pin |
| 2 | Vertical signal clamp pin | 12 | Horizontal oscillation pin |
| 3 | Video signal output pin | 13 | Horizontal AFC1 filter pin |
| 4 | DAC output pin 1 | 14 | Horizontal stabilized power supply pin (6.2 V) |
| 5 | Vertical sync. separation input pin | 15 | Lock detection filter pin |
| 6 | Horizontal sync. separation input pin | 16 | FBP input pin |
| 7 | Hold down reference voltage pin | 17 | GND pin |
| 8 | Lock detection output pin | 18 | Blanking pulse input pin |
| 9 | GND pin (sync. system) | 19 | Horizontal pulse output pin |
| 10 | Vertical pulse output pin | 20 | Y _S input pin |

■ Pin Descriptions (continued)

| Pin No. | Description | Pin No. | Description |
|---------|-------------------------------------|---------|--|
| 21 | B output pin | 35 | Black level detection filter pin |
| 22 | G output pin | 36 | Chroma signal input pin |
| 23 | R output pin | 37 | V _{CC1} reference voltage pin (9.6 V) |
| 24 | Output limiter pin | 38 | Power supply pin (V _{CC1} : 9 V) |
| 25 | Chroma oscillator pin | 39 | Capacitor pin for Y clamp |
| 26 | Spot killer pin | 40 | DAC output pin 2 |
| 27 | External B input pin | 41 | Y signal input pin |
| 28 | External G input pin | 42 | APL detection filter pin |
| 29 | External R input pin | 43 | SCL pin (for I ² C bus) |
| 30 | Chroma APC filter pin | 44 | SDA pin (for I ² C bus) |
| 31 | Subcarrier output pin | 45 | Killer output pin |
| 32 | Killer filter pin | 46 | Video signal input pin 3 |
| 33 | ABL/ACL input pin | 47 | Power supply pin (V _{CC2} : 5 V) |
| 34 | Black extension start adjusting pin | 48 | Video signal input pin 2 |

■ Absolute Maximum Ratings

| Parameter | Symbol | Rating | Unit | |
|----------------------------------|------------------|-----------------------|------|----|
| Supply voltage | V _{CC} | V _{CC1} (38) | 9.9 | V |
| | | V _{CC3} (47) | 5.5 | |
| Supply current | I _{CC} | I ₃₈ | 47 | mA |
| | | I ₄₇ | 31 | |
| | | I ₁₄ | 13 | |
| | | I ₃₇ | 5 | |
| Power dissipation *2 | P _D | 775 | mW | |
| Operating ambient temperature *1 | T _{opr} | -20 to +70 | °C | |
| Storage temperature *1 | T _{stg} | -55 to +150 | °C | |

Note) *1 : Except for the operating ambient temperature and storage temperature, all ratings are for T_a = 25°C.

*2 : The power dissipation shown is the value for T_a = 70°C.

■ Recommended Operating Range

| Parameter | Symbol | Range | Unit |
|----------------|------------------|--------------|------|
| Supply voltage | V _{CC1} | 8.55 to 9.45 | V |
| | V _{CC2} | 4.75 to 5.25 | |
| Supply current | I ₁₄ | 6.0 to 12 | mA |
| | I ₃₇ | 1.0 to 4.5 | |

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|----------------------------|--|------|------|------|---------------|
| SW and power supply | | | | | | |
| Circuit current 1 (I_{CC1}) (9 V system) | I_{38} | No signal input, $I_{14} = 8 \text{ mA}$, $V_{CC1} = 9 \text{ V}, V_{CC2} = 5 \text{ V}$ | 28 | 36 | 43 | mA |
| Circuit current 2 (I_{CC2}) (5 V system) | I_{47} | No signal input, $I_{14} = 8 \text{ mA}$, $V_{CC1} = 9 \text{ V}, V_{CC2} = 5 \text{ V}$ | 18 | 23 | 28 | mA |
| 9.6 V reference voltage | V_{37} | $I_{37} = 2.4 \text{ mA}$ | 9.0 | 9.6 | 10.2 | V |
| Operating resistance | R_{37} | $I_{37} = 1.0 \text{ mA to } 5.0 \text{ mA}$ | 0 | 11 | 30 | Ω |
| Zener maximum current | I_{VD} | Largest possible sink current | 5 | — | — | mA |
| SW circuit gain | G_{SW} | $f = 1 \text{ MHz}, 0.7 \text{ V[p-p]}$ | 4.9 | 5.9 | 6.9 | dB |
| Frequency characteristics | f_{SW} | Attenuation amount at 7 MHz with $f = 1 \text{ MHz}$ as reference | -3 | -1.3 | — | dB |
| Crosstalk | CT | $f = 1 \text{ MHz}$, input signal 0.7 V[p-p] , sine wave | -50 | — | — | dB |
| Clamp current | $I_1, I_{46},$ I_{48} | Sink current of each input pin, when applying 3 V to pin 1, pin 46 and pin 48 | 6 | 10 | 14 | μA |
| Total gain | G_{TOTAL} | Gain dispersion from each input to output | -19 | 0 | +19 | % |
| Y signal processing | | | | | | |
| Video input pin voltage | V_{41} | V_{CC} : Typ., input pin voltage measure- ment | 1.1 | 1.5 | 1.9 | V |
| Y typical output | E_{OSTD} | Input 2 V[p-p] stair steps | 2.6 | 3.2 | 3.8 | V[0-p] |
| Video voltage gain relative ratio | ΔG_Y | As same as the above, G/R, B/R | -1.0 | 0 | +1.0 | dB |
| Video voltage gain | G_Y | Input 2 V[p-p] stair steps, contrast: typ. | 1.7 | 2.1 | 2.5 | V[0-p] |
| Video frequency characteristics | f_Y | Attenuation amount at 6 MHz with $f = 1 \text{ MHz}$ as reference | -5.0 | -2.0 | — | dB |
| Picture quality variable range 1 | G_{S1} | Input 0.2 V[p-p], sine wave $f = 2.5 \text{ MHz}$, sharpness: typ./min. | 5.9 | 9.0 | 11.4 | dB |
| Contrast ratio | G_C | Input 2 V[p-p] stair steps, contrast: max./min. | 6 | 9 | 12 | dB |
| Brightness variable range | BR | Input: Without input, cut-off: max. , brightness: min. to max. , pedestal level measurement | 2.15 | 2.40 | 2.80 | V |
| Typical pedestal voltage | PL_{STD} | Input: Without input | 1.95 | 2.60 | 3.10 | V |
| DC restoration ratio 1 | T_{DC1} | Input 2.0 V[p-p] total white, APL 10% to 90%, DC restoration ratio correction: Off (pin 42: 0 V) | 94 | 100 | 106 | % |
| RGB output BLK level | Y_{BLK} | V_{CC} : typ. | 1.0 | 1.5 | 2.0 | V |
| Black level correction amplitude 1 | V_{BL1} | Input signal: Total black, black level detection pin: external RC $\rightarrow 9 \text{ V}$, BL start = 20 k Ω | -100 | 0 | +100 | mV |

Note) Unless otherwise specified, refer to "• Typical conditions for testing" for the conditions of I²C bus and each pin.

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|------------------------------------|--------------|--|-----------|-----------|------|--------|
| Y signal processing (continued) | | | | | | |
| Black level correction amplitude 2 | V_{BL2} | Input signal: Total black, black level detection pin: 3 V, BL start = 20 k Ω | 0.46 | 0.80 | 1.14 | V |
| Black level correction amplitude 3 | V_{BL3} | Adjust output amplitude to 0.8 V[p-p], black level detection pin: 9 V \rightarrow external RC, BL start = 20 k Ω | 0.10 | 0.25 | 0.40 | V |
| Black level correction amplitude 4 | V_{BL4} | Adjust output amplitude to 2.0 V[p-p], black level detection pin: 9 V \rightarrow external RC, BL start = 20 k Ω | -0.1 | 0 | +0.1 | V |
| Y signal delay time | t_{D1} | Input 2.0 V[p-p] stair step, B.P.F. SW: On, trap SW: On, measurement of time delay between input and output | 330 | 410 | 490 | ns |
| Sub-contrast adjustment range 1 | E_{OAdj1} | Sub-contrast typ. \rightarrow min., input: 2 V[p-p] stair step | -40 | -30 | -22 | % |
| Sub-contrast adjustment range 2 | E_{OAdj2} | Sub-contrast typ. \rightarrow max., input: 2 V[p-p] stair step | 35 | 46 | 55 | % |
| Trap attenuation amount | G_{TRAP} | $f = 3.579545$ MHz, trap on/off | 23 | — | — | dB |
| Delay line | Δt_D | Difference of amount of delay between B.P.F. on/off | 90 | 120 | 150 | ns |
| ACL variable range | ΔACL | Pin 33 7.5 V \rightarrow 2.5 V, stair step 2 V[p-p] | 12 | 20 | 28 | % |
| ABL variable range | ΔABL | Without input, pin 33: 4.5 V \rightarrow 2.5 V, pedestal voltage of RGB output | 0.4 | 0.6 | 0.8 | V |
| Color signal processing | | | | | | |
| ACC characteristics 1 | ACC1 | Color bar input: 6 dB up, (R-Y) output measurement, burst typical input = 150 mV[p-p] | 0.9 | 1.0 | 1.1 | Times |
| ACC characteristics 2 | ACC2 | Color bar input: 20 dB down, (R-Y) output measurement, burst typical input = 150 mV[p-p] | 0.7 | 0.9 | 1.1 | Times |
| Color killer tolerance 1 | e_{K1} | Level at which demodulation output does not appear when color bar input level is being attenuated. Typical input level: 0 dB | -53 | -43 | -34 | dB |
| Color difference output (B-Y) 1 | e_{O1} | Color bar input, color: typ., tint: Center | 1.55 | 2.00 | 2.45 | V[0-p] |
| Color difference output (B-Y) 2 | e_{O2} | Color bar input, color: max., tint: Center | 2.85 | 3.7 | 4.5 | V[0-p] |
| Color residue | e_{LC} | Color bar input, color: min. | — | 15 | 60 | mV |
| Chroma contrast | C_{CONT} | Color bar input, contrast: min. \rightarrow max. | 5.2 | 8.2 | 11.2 | dB |
| Free-running frequency | f_{C0} | For f_0 of typical sample, $f_0 = 3.579545$ MHz | -300 | 0 | +300 | Hz |
| APC pull-in range 1 | f_{APC} | Color bar: Typical input, B.P.F.: On | ± 450 | ± 600 | — | Hz |
| Tint center data | TC | Rainbow signal, tint data at which B-Y output becomes typical. | 15 | 1D | 25 | H |

Note) Unless otherwise specified, refer to "• Typical conditions for testing" for the conditions of I²C bus and each pin.

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|-----------------|--|----------|----------|------|---------------|
| Color signal processing (continued) | | | | | | |
| Tint variable range | $\Delta\theta$ | Tint = min. to max. | ± 30 | ± 45 | — | deg |
| Demodulation output ratio R/B | R/B | Rainbow input | 0.76 | 0.96 | 1.15 | Times |
| Demodulation output ratio G/B | G/B | Rainbow input | 0.27 | 0.36 | 0.45 | Times |
| Demodulation angle $\angle R$ | $\angle R$ | Reference is $\angle B$ | 96 | 104 | 112 | deg |
| Demodulation angle $\angle G$ | $\angle G$ | Reference is $\angle B$ | 225 | 235 | 245 | deg |
| Demodulation output residual carrier | A_{FSC} | f_{SC} component of demodulation output | — | 20 | 50 | mV[p-p] |
| CW output DC level 1 | $V_{31(1)}$ | Subcarrier output: Off | 1.4 | 1.9 | 2.4 | V |
| CW output DC level 2 | $V_{31(2)}$ | Subcarrier output: On | 5.6 | 6.1 | 6.6 | V |
| CW Out output level | A_{CW} | Output level of f_{SC} | 250 | 350 | 500 | mV[p-p] |
| High-level killer output | KIL_H | Pin 45 voltage measurement, $V_{32} = 5.5\text{ V}$ | 4.0 | 4.6 | — | V |
| Low-level killer output | KIL_L | Pin 45 voltage measurement, $V_{32} = 4\text{ V}$ | — | 0.4 | 1.0 | V |
| Killer output open | KIL_{OP} | At VV mode, I_{45} measurement, $V_{32} = 4\text{ V}$ or 5.5 V | -1 | 0 | +1 | μA |
| RGB processing | | | | | | |
| RGB output DC difference voltage | ΔPL_1 | $\Delta V = V_R - V_G, V_G - V_B, V_B - V_R$, burst input only, cut off: min. | -300 | 0 | +300 | mV |
| RGB output limit level | V_{LIM} | Input: 2.0 V[p-p], total white, contrast: max., cut off: max., bright: max. | 6.6 | 6.9 | 7.2 | V |
| External RGB input clip level 1 | E_{G1} | Y_S : H, contrast: max., difference from internal pedestal voltage, cut off: min., drive: typ. | 2.2 | 2.6 | 3.0 | V |
| External RGB input clip level 2 | E_{G2} | Y_S : H, contrast: min., difference from internal pedestal voltage, cut off: min., drive: typ. | 1.1 | 1.6 | 2.1 | V |
| External RGB input clip level difference | ΔE_{G1} | Y_S : H, contrast: max., external input clip level difference among R, G and B channel | -300 | 0 | +300 | mV |
| External RGB gain | G_{EXT} | Y_S : H, contrast: max., input voltage: 0.3 V[p-p], sine wave, 1 MHz | 1.6 | 2.3 | 3.0 | Times |
| External RGB frequency characteristics | f_{EXT} | Y_S : H, contrast: max., input voltage: 0.3 V[p-p], sine wave, reference: 1 MHz, attenuation amount at 7 MHz | -4.8 | -1.8 | — | dB |
| Internal/external pedestal difference voltage | ΔPL_2 | Burst input only, Y_S : high/low | 50 | 250 | 600 | mV |
| Y_S threshold level | Y_S | Pin 20 voltage at which inside and outside change over | 1.1 | 1.6 | 2.1 | V |
| Cut-off variable range | ΔCO | Without input, cut off: min. to max. | 1.2 | 1.5 | 1.8 | V |
| Drive variable range | ΔDR | Input: staircase, 2.0 V[p-p], drive: min. to max. | 5 | 7 | 9 | dB |

Note) Unless otherwise specified, refer to "• Typical conditions for testing" for the conditions of I²C bus and each pin.

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--|--------------------|---|-----------|-----------|-------|---------------|
| Horizontal signal processing | | | | | | |
| Horizontal stabilized power supply voltage | V_{14} | Pin voltage, when power supply pin input current $I_{14} = 8 \text{ mA}$ | 5.7 | 6.1 | 6.8 | V |
| Horizontal stabilized power supply maximum current | I_{14} | Maximum input current for which power supply is stabilized | 13 | — | — | mA |
| Horizontal stabilized power supply on-state resistance | R_{14} | On-state resistance, when input current $I_{14} = 6 \text{ mA}$ to 13 mA | 0 | 14 | 30 | Ω |
| Horizontal output start voltage | V_{FHS} | Horizontal stabilized power supply voltage, when horizontal output pulse becomes 1 V[p-p] or more. Do not apply other power supply voltage. | — | 4.5 | 5.2 | V |
| Horizontal output pulse duty | τ_{HO} | Horizontal output pulse high level duty | 46.9 | 50.0 | 53.1 | % |
| High-level horizontal output | $V_{19\text{H}}$ | Horizontal output pulse high level | 4.0 | 4.3 | 4.6 | V |
| Low-level horizontal output | $V_{19\text{L}}$ | Horizontal output pulse low level | — | 0.2 | 0.5 | V |
| Horizontal output free-running frequency | f_{HO} | Horizontal output frequency, when there is no horizontal sync. separation input | 15.45 | 15.73 | 16.05 | kHz |
| Hor. pull-in range | f_{HP} | Frequency at which horizontal sync. separation input frequency pulls in. Sync. signal 0.57 V[p-p]. | ± 500 | ± 600 | — | Hz |
| Screen position fluctuation 1 | H_{POS1} | Phase change of horizontal sync. signal and FBP, H-center (0A): 67 \rightarrow 60 | -1.70 | -2.12 | -2.55 | μs |
| Screen position fluctuation 2 | H_{POS2} | Phase change of horizontal sync. signal and FBP, H-center (0A): 67 \rightarrow 6F | 1.97 | 2.46 | 3.14 | μs |
| Hold Down operation level | V_{HD} | Voltage at which X-ray input pin voltage holds down. Hold down pin reference voltage: 6.2 V | 5.9 | 6.2 | 6.5 | V |
| High-level lock det. output | LD_{H} | At horizontal AFC unlocked, RL = 56 k Ω | 4.5 | — | — | V |
| Low-level lock det. output | LD_{L} | At horizontal AFC locked, RL = 56 k Ω | — | — | 0.7 | V |
| BLK-in input threshold voltage | BLK_{ST} | Pin 18 threshold voltage (BLK is applied to RGB output stage only) | 1.7 | 2.2 | 2.7 | V |
| Vertical signal processing | | | | | | |
| Ver. out pulse width | τ_{VO} | Pulse width at horizontally/vertically synchronized state | 610 | 640 | 670 | μs |
| High-level ver. out 1 | $V_{10\text{H1}}$ | Vertical output pulse high level pin 10: open | 4.0 | 4.3 | 4.6 | V |
| High-level ver. out 2 | $V_{10\text{H2}}$ | Vertical output pulse high level pin 10: -0.2 mA | 3.75 | 4.10 | 4.60 | V |
| High-level ver. out 3 | $V_{10\text{H3}}$ | Vertical output pulse high level pin 10: -0.5 mA | 3.3 | 3.9 | 4.6 | V |

Note) Unless otherwise specified, refer to "• Typical conditions for testing" for the conditions of I²C bus and each pin.

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--|--------------------|--|------|------|------|------|
| Vertical signal processing (continued) | | | | | | |
| Low-level ver. out | V_{10L} | Vertical output pulse low level | — | 0 | 0.3 | V |
| V_{OUT} free-running frequency | f_{VO} | Ver. out frequency, when there are no hor. and ver. sync. signals input. | 58 | 60 | 62 | Hz |
| Vertical pull-in range | f_{VP} | Sync. input: 2 V[p-p], measurement should be conducted from not pulled in state. | 56 | — | 64 | Hz |
| V_{OUT} position shift | V_{POS} | V position: min. → max. | — | 31 | — | H |
| I ² C processing | | | | | | |
| SCL, SDA input threshold voltage | V_{SCL}, V_{SDA} | | 1.5 | — | 3.0 | V |
| Sink capability at ACK | ACK | I = 3 mA when pull-up resistor is 1.6 k Ω | — | — | 0.4 | V |
| High level DAC output 1 | V_{4H} | Pin 4 output DC voltage, 0D = 7F | 8.25 | 8.75 | 9.25 | V |
| High level DAC output 2 | V_{40H} | Pin 40 output DC voltage, 0C = 7F | 4.5 | 5.0 | 5.5 | V |
| Low level DAC output 1 | V_{4L} | Pin 4 output DC voltage, 0D = 00 | 0.60 | 0.90 | 1.20 | V |
| Low level DAC output 2 | V_{40L} | Pin 40 output DC voltage, 0C = 00 | 0 | 0.1 | 0.2 | V |

Note) Unless otherwise specified, refer to "• Typical conditions for testing" for the conditions of I²C bus and each pin.

• Design reference data

Note) The characteristics listed below are theoretical values based on the IC design and are not guaranteed.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|-----------------------|--|------|------|------|----------------------|
| SW power supply | | | | | | |
| Reference voltage-temperature characteristics | $\Delta V_{37} / T_a$ | $I_{37} = 2.4 \text{ mA}$, $T = -20^\circ\text{C}$ to $+70^\circ\text{C}$ | -1.4 | -1.8 | -2.2 | mV/ $^\circ\text{C}$ |
| SW input dynamic range | SW_D | 1 V[p-p] is reference (0 dB), $V_{CC1} = 9 \text{ V}$, $V_{CC2} = 5 \text{ V}$ | 6 | — | — | dB |
| Input clamp voltage | V_1, V_{46}, V_{48} | Without input, pin 1, pin 46 and pin 48 voltage | 1.8 | 2.2 | 2.6 | V |
| SW output voltage | V_3 | Without input, pin 3 voltage | 2.6 | 3.0 | 3.4 | V |
| SW output–Y input DC difference voltage | $V_3 - V_{41}$ | Without input, difference voltage between pin 3 and pin 41 | 1.0 | 1.2 | — | V |
| SW output–H. Sync. DC difference voltage | $V_3 - V_6$ | Without input, difference voltage between pin 3 and pin 6 | 1.0 | 1.2 | — | V |
| SW output–V. Sync. DC difference voltage | $V_3 - V_5$ | Without input, difference voltage between pin 3 and pin 5 | 1.0 | 1.2 | — | V |
| Y signal processing | | | | | | |
| Video maximum output voltage | E_{Omax} | Brightness: max. | — | 7.5 | — | V |
| Y signal input dynamic range | Y_{IN} | Input D range measurement, contrast: typ., sub-contrast: typ. | — | 4.0 | — | V[p-p] |
| Picture quality variable range 2 | G_{S2} | Input: 0.2 V[p-p], sine wave, $f = 2.5 \text{ MHz}$, sharpness: max./min. | — | 13 | — | dB |

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

• Design reference data (continued)

Note) The characteristics listed below are theoretical values based on the IC design and are not guaranteed.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--|--------------------------|---|------|------|------|----------|
| Y signal processing (continued) | | | | | | |
| Contrast fluctuation with picture quality control | ΔA_{SC} | Input: 2.0 V[p-p], stair step, sharpness: max./min. | -300 | — | +300 | mV[p-p] |
| Brightness relative control sensitivity | ΔBR | Same as the above G/R, B/R, brightness: min. → max. | 0.9 | 1 | 1.1 | Times |
| Black level correction starting point voltage | V_{BLSTA} | BL start external resistor: 20 k Ω | — | 53 | — | IRE |
| Video signal output supply voltage dependency | $\Delta E_O / V_{CC}$ | Input: 2.0 V[p-p], stair step, output amplitude change of $V_{CC} = \pm 5\%$ | — | 0 | 0.25 | V[p-p]/V |
| Output DC voltage ambient temperature dependency | $\Delta E_{ODC} / T_a$ | Pedestal level change ratio, when T_a changes from 50°C to 75°C, contrast: max., brightness: typ. | — | -1.8 | — | mV/°C |
| Y S/N | $Y_{S/N}$ | Input: 2.0 V[p-p], stair step, noise meter measurement, contrast: max., sharpness: min. | 53 | 55 | — | dB |
| Service SW operation 1 | $SRSW_1$ | Input: 2.0 V[p-p], stair step, service SW: Measurement of output amplitude, when SW is on. | — | 10 | 150 | mV[p-p] |
| Service SW operation 2 | $SRSW_2$ | Service SW: On, DC voltage measurement at no-appearance of V_{OUT} . | 3.8 | 4.3 | 4.8 | V |
| DC restoration ratio 2 | T_{DC2} | 2.0 V[p-p], stair step, APL det. = 20 k Ω | — | 120 | — | % |
| Trap center frequency | f_{0TRAP} | Difference from $f = 3.579545$ MHz | -70 | — | +70 | kHz |
| Delay amount of trap | τ_{TRAP} | $f = 0.5$ MHz, comparison of delay amount between trap on/off | — | 40 | — | ns |
| Temperature characteristics of trap attenuation amount | $\Delta G_{TRAP} / T_a$ | $f = 3.579545$ MHz, -20°C to +70°C | 23 | — | — | dB |
| Temperature characteristics of trap frequency | $\Delta f_{TRAP} / T_a$ | -20°C to +70°C | -50 | — | +50 | kHz |
| ACL start voltage | ACL_{STA} | Pin 33 voltage at which ACL starts to become effective | — | 7.1 | — | V |
| ACL stop voltage | ACL_{STO} | Pin 33 voltage at which ACL stops | — | 2.9 | — | V |
| ABL start voltage | ABL_{STA} | Pin 33 voltage at which ABL starts to become effective | — | 4.0 | — | V |
| ABL stop voltage | ABL_{STO} | Pin 33 voltage at which ABL stops | — | 3.0 | — | V |
| Color signal processing | | | | | | |
| Maximum color difference output | e_{Omax} | Color bar input, brightness: min., color: max., pedestal to peak voltage | — | 4.5 | — | V[0-p] |
| Free-running frequency supply voltage dependency | $\Delta f_{CO} / V_{CC}$ | $V_{CC} = \pm 5\%$ | -250 | — | +250 | Hz |
| VCO control sensitivity | β | Check change in oscillation frequency, when $V_{APC} = 5.6$ V to 5.8 V | — | 2.8 | — | Hz/mV |

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

• Design reference data (continued)

Note) The characteristics listed below are theoretical values based on the IC design and are not guaranteed.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|----------------------------|--|------|----------|------|----------------------|
| Color signal processing (continued) | | | | | | |
| Free-running frequency ambient temperature dependency | $\Delta f_{\text{CO}}/T_a$ | Ambient temperature: -20°C to $+70^\circ\text{C}$ | — | -2.9 | — | Hz/ $^\circ\text{C}$ |
| Phase detection sensitivity | μ | $\{1/(\Delta\phi \times \beta)\} \times 100$ | — | 22.3 | — | mV/deg |
| Phase hold characteristic | $\Delta\phi$ | Change amount of tint, when f_{SC} is shifted by ± 300 Hz | — | 1.6 | — | deg/100 Hz |
| Demodulation output frequency characteristic | Δf_{-3} | Frequency at which color output pin becomes -3 dB | — | 1.1 | — | MHz |
| Demodulation output supply voltage dependency | $\Delta e_o/V_{\text{CC}}$ | Tint: typ., contrast: typ., $V_{\text{CC}} \pm 5\%$, color: typ. | — | 0 | — | % |
| Demodulation output ambient temperature dependency | $\Delta e_o/T_a$ | $T_a = -20^\circ\text{C}$ to $+70^\circ\text{C}$, $+25^\circ\text{C}$ is typ. | — | ± 7 | — | % |
| Tint Center shift | ΔT_C | Change amount of tint center, when B.P.F. is used and not. | — | ± 4 | — | H |
| H.P.F. frequency characteristic | f_{HPF} | Gain at $f = f_{\text{SC}}$ | — | -12 | — | dB |
| H.P.F. group delay amount | τ_{HPF} | Group delay amount at $f = f_{\text{SC}}$ | — | 140 | — | ns |
| Color killer tolerance 2 | e_{K2} | B.P.F. on state | — | -43 | — | dB |
| Chroma delay amount | τ_{CHO} | Delay from pin 36 input to pin 21 output | — | 375 | — | ns |
| C-Y/Y ratio | C-Y/Y | Color data, when C-Y/Y ratio becomes 1.0 | — | 40 | — | H |
| RGB processing | | | | | | |
| Y output amplitude fluctuation (trap on/off) | ΔE_{OTRAP} | 2 V[p-p] staircase input, amplitude fluctuation at trap on/off | — | ± 10 | — | % |
| Y output amplitude fluctuation (B.P.F. on/off) | ΔE_{OBPF} | 2 V[p-p] staircase input, amplitude fluctuation at B.P.F. on/off | — | ± 10 | — | % |
| Y output amplitude fluctuation (sharpness) | ΔE_{OSHARP} | 2 V[p-p] staircase input, sharpness: min. \rightarrow max. | — | ± 5 | — | % |
| Spot killer operation | V_{SPK} | V_{CC1} voltage at which RB_{RGB} output becomes high, when pin 26 voltage = 8.25 V | — | 7.6 | — | V |
| Horizontal signal processing | | | | | | |
| Sync. separation clamp voltage | V_5, V_6 | Clamp voltage of sync. separation input pin (pin 5 and pin 6) | — | 1.4 | — | V |
| Black out operation level | V_{BLOUT} | Voltage at which Y output blacks out when X-ray input pin voltage is raised from 0 V | — | 6.3 | — | V |
| Operating frequency at hold down | f_{HD} | Frequency of H_{OUT} at the time of hold down when X-ray input pin voltage is raised from 0 V | 16.3 | 16.4 | 16.8 | kHz |
| BGP start position | BGP_{STA} | Phase difference from rear edge of hor. sync. to BPG at horizontal AFC loop on | 0.3 | 0.5 | 0.7 | μs |

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

• Design reference data (continued)

Note) The characteristics listed below are theoretical values based on the IC design and are not guaranteed.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--|---------------------|--|-------|-----------|------|---------------|
| Horizontal signal processing (continued) | | | | | | |
| BGP pulse width | BGP_W | BGP width at horizontal AFC loop on | 2.5 | 3.0 | 3.5 | μs |
| FBP level 1 | V_{FBP1} | AFC operation DC level at FBP input pin | 1.4 | 2.0 | 2.2 | V |
| FBP level 2 | V_{FBP2} | HBLK operation DC level at FBP input pin | 0.3 | 0.7 | 1.1 | V |
| FBP delay operating range | τ_{FBP} | Range of normal operation, when delay amounts are being changed from raise of H_{OUT} to FBP center. | 10.0 | to | 22.0 | μs |
| Horizontal oscillation frequency temperature characteristics | $\Delta f_{HO}/T_a$ | Change in ambient temperature from -20°C to $+70^\circ\text{C}$ | — | ± 100 | — | Hz |
| Vertical signal processing | | | | | | |
| V. BLK pulse width | $VBLK_W$ | VBLK width at R,G,B out in horizontal/vertical synchronization | — | 17.0 | — | H |
| I ² C processing | | | | | | |
| Each DAC precision for 4-bit, 5-bit, 6-bit | DAC1 | $1\text{LSB} = \{\text{data (max.)} - \text{data (min.)}\} / (2N-1)$ | 0.1 | 1 | 1.9 | LSB/step |
| Each DAC precision for 7-bit, 7+1-bit, (40) excluded | DAC2 | $1\text{LSB} = \{\text{data (max.)} - \text{data (min.)}\} / (2N-1)$ | 0.1 | 1 | 1.9 | LSB/step |
| Each DAC precision for 7-bit, 7+1-bit, (40) only | DAC3 | $1\text{LSB} = \{\text{data (max.)} - \text{data (min.)}\} / (2N-1)$ | -1 | 1 | 2 | LSB/step |
| Each DAC precision for 7+1-bit (7F \rightarrow 80) | DAC4 | $1\text{LSB} = \{\text{data (max.)} - \text{data (min.)}\} / (2N-1)$, sub address; 06, 07 (Change amount/total change amount) \times 100 | -9.25 | -6.25 | 0 | % |

• Typical conditions for testing

1. Input signal

- 1) Video: 10-step staircase, 2.0 V[p-p]
- 2) Chroma: Color bar signal: Burst level 150 mV[p-p]
Rainbow signal: Burst level 150 mV[p-p]
- 3) Sync. signal: Video signal 1.5 V[p-p] to 2.5 V[p-p] for both horizontal and vertical sync. signal input

2. I²C bus conditions

| Sub address | Control | Data (H) | Sub address | Control | Data (H) |
|-------------|------------|----------|-------------|--------------------|----------|
| 00 | Color | 40 | 08 | Drive G | 40 |
| 01 | Tint | 20 | 09 | Drive B | 40 |
| 02 | Brightness | 40 | 0A | Y-adjust, H-center | 67 |
| 03 | Contrast | 3F | 0B | Test, V-position | 00 |
| 04 | Sharpness | 00 | 0C | DAC1 | 40 |
| 05 | Cut off R | 00 | 0D | DAC2 | 40 |
| 06 | Cut off G | 00 | 0E | SW | 50 |
| 07 | Cut off B | 00 | | | |

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

• Typical conditions for testing (continued)

3. State of each pin

| Pin No. | Symbol | State |
|---------|-----------|----------------------------|
| 18 | BLK in | 0 V |
| 20 | Y_S | 1.1 V |
| 24 | Limiter | V_{CC1} |
| 33 | ABL/ACL | 7.5 V |
| 34 | BL start | 20 k Ω |
| 35 | BL det. | V_{CC1} |
| 38 | V_{CC1} | Applied from outside (9 V) |
| 42 | APL det. | 0 V |
| 47 | V_{CC2} | 5 V |

• Functions of SW controlled by I²C bus

| Data-bit | Functions of SW | Contents | | | | | | | | | | | | | | | | | | | | |
|----------------|--|---|--------------|------------|--------------|---|--------|---------------|-----|--------|---|------|--------|---|---|---------------|---|---|---|------|-----|---|
| 0E-D0 0E-D1 | AV SW changeover <table border="1"> <thead> <tr> <th>D1</th> <th>D0</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>Video1</td> </tr> <tr> <td>0</td> <td>1</td> <td>Video2</td> </tr> <tr> <td>1</td> <td>0</td> <td>Video3</td> </tr> <tr> <td>1</td> <td>1</td> <td>Mute</td> </tr> </tbody> </table> | D1 | D0 | Output | 0 | 0 | Video1 | 0 | 1 | Video2 | 1 | 0 | Video3 | 1 | 1 | Mute | <ol style="list-style-type: none"> Composite signal changeover Input Video1: Pin 1 Video2: Pin 48 Video3: Pin 46 Output : Pin 3 No output at mute | | | | | |
| D1 | D0 | Output | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | Video1 | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | Video2 | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | Video3 | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | Mute | | | | | | | | | | | | | | | | | | | | |
| 0E-D2 | Chroma trap SW (0 → without trap) (1 → with trap) | <ol style="list-style-type: none"> Video circuit chroma trap changeover (Y signal phase leads by about 40 ns at trap off (through)) | | | | | | | | | | | | | | | | | | | | |
| 0E-D3 | Chroma B.P.F. SW (0 → without B.P.F.) (1 → with B.P.F.) | <ol style="list-style-type: none"> Chroma circuit band-pass filter changeover (Video signal delay amount varies according to B.P.F. on/off) | | | | | | | | | | | | | | | | | | | | |
| 0E-D4 0E-D7 | EE/VV SW <table border="1"> <thead> <tr> <th>D7</th> <th>D4</th> <th>Killer out</th> <th>f_{SC} out</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>Killer result</td> <td>Yes</td> </tr> <tr> <td>0</td> <td>1</td> <td>Open</td> <td>No</td> </tr> <tr> <td>1</td> <td>0</td> <td>Killer result</td> <td>Yes</td> </tr> <tr> <td>1</td> <td>1</td> <td>Open</td> <td>Yes</td> </tr> </tbody> </table> | D7 | D4 | Killer out | f_{SC} out | 0 | 0 | Killer result | Yes | 0 | 1 | Open | No | 1 | 0 | Killer result | Yes | 1 | 1 | Open | Yes | <ol style="list-style-type: none"> Tuner (EE) and VTR (VV) changeover In principle change over by D4 Tuner (EE): Killer result is output f_{SC} is output VTR (VV): Killer result is not output f_{SC} is not output However, f_{SC} is output if D7 = 1 even at VV. Killer out: Pin 45, f_{SC} out: Pin 31 |
| D7 | D4 | Killer out | f_{SC} out | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | Killer result | Yes | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | Open | No | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | Killer result | Yes | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | Open | Yes | | | | | | | | | | | | | | | | | | | |
| 0E-D5 | SSW (service SW) (0 → normal) (1 → service mode) | <ol style="list-style-type: none"> At service mode (no vertical scanning, white balance adjustment) Vertical output pulse stops (DC about 4.3 V) Y output off, chroma output small | | | | | | | | | | | | | | | | | | | | |
| 0E-D6 | BLK off SW (0 → normal) (1 → output without BLK) | <ol style="list-style-type: none"> RGB output blanking (BLK) off changeover To be used when RGB output signal without BLK is required. | | | | | | | | | | | | | | | | | | | | |

■ Terminal Equivalent Circuits

| Pin No. | Equivalent circuit | Description | Voltage |
|---------|--------------------|--|---------------------------------------|
| 1 | | <p>Video signal input pin 1:</p> <ul style="list-style-type: none"> • Video signal input pin • Typical input 1.0 V[p-p] • Input through capacitor, and sync. top is clamped at 2.2 V • Input video signal with low impedance | <p>AC</p> |
| 2 | | <p>Vertical signal clamp pin:</p> <ul style="list-style-type: none"> • Peak clamp pin for separating vertical sync. signal | <p>AC</p> <p>$f = f_v$</p> |
| 3 | | <p>Video signal output pin:</p> <ul style="list-style-type: none"> • Outputs signals inputted from pin 1, pin 46 and pin 48 • Control of output signal is carried out by I²C bus • Recommended range of use is from -2 mA to +2 mA | <p>AC</p> |
| 4 | | <p>DAC output pin 1:</p> <ul style="list-style-type: none"> • Output voltage is adjustable in 128 stages (7-bit organization) by sub-address of I²C bus (0D). • Recommended range of use is from -70 μA to +70 μA | <p>DC</p> <p>0.95 V to 8.75 V</p> |
| 5 6 | | <p>Pin 5: Vertical sync. separation input pin: Pin 6: Horizontal sync. separation input pin:</p> <ul style="list-style-type: none"> • $R_V > R_H$ so that slice level is made deep for vertical sync. and shallow for horizontal sync. • Cutoff frequency determined by R_H and CH shall be about 500 kHz. • $R \rightarrow$ large, slice level becomes deeper. (Weak in sync. compression) • $R \rightarrow$ small, slice level is shallow. (Weak in fluctuation such as V sag) | <p>AC</p> |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Description | Voltage |
|---------|--------------------|--|---|
| 7 | | <p>Hold down reference voltage pin:</p> <ul style="list-style-type: none"> Operates hold down by comparing voltage inputted to pin 11 $V_7 > V_{11}$: Normal operation $V_7 < V_{11}$: Out of horizontal sync. $V_7 + 0.1 \text{ V} < V_{11}$: Output with all BLK. <p>Recommended range of use is from 3 V to 7 V</p> | <p>DC</p> <p>6.2 V</p> |
| 8 | | <p>Lock detection output pin:</p> <ul style="list-style-type: none"> Pin which outputs whether vertical sync. signal of input and H_{OUT} are synchronizing. <p>Recommended range of use is from 0 mA to 0.2 mA</p> | <p>DC</p> <p>0.7 V or less at lock, 4.5 V or more at unlock</p> |
| 9 | — | <p>GND pin:</p> <ul style="list-style-type: none"> Sync. system GND | — |
| 10 | | <p>Vertical pulse output pin:</p> <ul style="list-style-type: none"> Negative polarity, pulse width 10H <p>Recommended range of use is from -0.7 mA to 0 mA</p> | <p>AC</p> <p>4.3 V 0 V</p> |
| 11 | | <p>Hold down reference voltage pin:</p> <ul style="list-style-type: none"> Voltage in proportion to a high-tension of CRT is applied. | <p>DC</p> |
| 12 | | <p>Horizontal oscillation pin:</p> <ul style="list-style-type: none"> Oscillates at $32f_H \cong 503 \text{ kHz}$ by means of ceramic oscillator element Makes horizontal and vertical pulse by internal countdown circuit of IC. | <p>AC</p> <p>$f = 32f_H$ (approx.) 503 kHz</p> |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Description | Voltage |
|---------|---|--|--|
| 13 | <p>Duty 50% Hor. sync. 1 000 μA 1.5 V 10 μF R2 2.2 kΩ C2 C1 0.018 μF 200 μA Hor. OSC R1 27 kΩ 2.2 kΩ 4.4 kΩ 2.2 kΩ 4.4 kΩ 4.3 V</p> | <p>Horizontal AFC1 filter pin:</p> <ul style="list-style-type: none"> Charges and discharges the capacitor connected to pin 13 after comparing the phase of horizontal sync. signal and pulse inside IC. R1, R2, C1 and C2 are lag-lead filter for AFC1. <p>Horizontal β curve f_H V_{13}</p> | <p>DC typ. 4.3 V</p> |
| 14 | <p>12 V 760 Ω 0.01 μF 47 μF 6.1 V</p> | <p>Horizontal stabilized power supply pin:</p> <ul style="list-style-type: none"> Stabilized power supply for horizontal circuit. A constant voltage circuit is inside. Recommended range of use is from 6 mA to 12 mA | <p>DC 6.1 V</p> |
| 15 | <p>200 Ω 200 Ω 800 μA 800 μA 10 kΩ 3.7 V 12 kΩ 200 Ω 1.5 V 200 Ω 10 μA 0.022 μF 15</p> | <p>Lock detection pin:</p> <ul style="list-style-type: none"> Detects phase of horizontal sync. signal and horizontal output pulse, and outputs the results. Color control becomes minimum and chroma output becomes zero in asynchronous. Pin 15 becomes low in out of sync. | <p>DC In synchronization approx. 4.5 V In asynchronous approx. 0.7 V</p> |
| 16 | <p>12 kΩ 100 μA 50 μA 100 μA 50 μA 100 μA 39 kΩ 1.95 V 2.7 kΩ 16 24 kΩ 0.75 V 2.7 kΩ 60 kΩ 500 Ω 40 kΩ 500 Ω 100 kΩ To AFC To HBLK</p> | <p>FBP input pin:</p> <ul style="list-style-type: none"> FBP input pin for horizontal blanking and AFC circuit. Threshold level HBLK: 0.75 V AFC: 1.9 V Burst gate pulse monitor pin Current is flowing out at BGP timing Voltage input of 0 V or less is inhibited Recommended range of use is from 0 V to 5 V | <p>AC FBP</p> <p>5 V 0 V</p> |
| 17 | — | <p>GND pin:</p> <ul style="list-style-type: none"> Main GND | — |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Description | Voltage |
|----------------|--------------------|--|-----------------|
| 18 | | <p>Blanking pulse input pin:</p> <ul style="list-style-type: none"> Input threshold voltage: 2.1 V Operation $V_{18} < 1.6 \text{ V}$: Normal operation $V_{18} > 2.6 \text{ V}$: RGB outputs are blanked Recommended range of use is from 0 V to 5 V | <p>AC</p> |
| 19 | | <p>Horizontal pulse output pin:</p> <ul style="list-style-type: none"> Output pulse duty is 50% Recommended range of use is from -7 mA to 0 mA | <p>AC Pulse</p> |
| 20 | | <p>Y_S input pin:</p> <ul style="list-style-type: none"> Fast blanking input pulse input pin for OSD Input threshold voltage 1.6 V Low: Normal output High: OSD output Recommended range of use is from 0 V to 5 V | <p>AC Pulse</p> |
| 21 22 23 | | <p>Pin 21: B output pin: Pin 22: G output pin: Pin 23: R output pin:</p> <ul style="list-style-type: none"> Those are R,G,B output pin Recommended range of use is from -2 mA to +2mA | <p>AC</p> |
| 24 | | <p>Output limiter pin:</p> <ul style="list-style-type: none"> This pin determines the voltage to clip high side of R,G,B output. R,G,B output is clipped at 6.8 V at open. Recommended range of use is from 0 V to V_{CC1} | <p>DC</p> |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Description | Voltage |
|----------------|--------------------|---|---|
| 25 | | <p>Chroma oscillation pin:</p> <ul style="list-style-type: none"> • Pattern of pin and oscillator element should be as short as possible. $f = 3.58 \text{ MHz}$ | <p>AC</p> <p>$f = f_{C0}$ approx. 0.3 V[p-p]</p> |
| 26 | | <p>Spot killer pin:</p> <ul style="list-style-type: none"> • This is used for quick discharging CRT electric charge, when set power is turned off. • Operating speed varies by changing external capacitance • Recommended range of use is from 0 V to 9 V | <p>DC</p> |
| 27 28 29 | | <p>Pin 27: External B input pin: Pin 28: External G input pin: Pin 29: External R input pin:</p> <ul style="list-style-type: none"> • External input pin for OSD • Input limit voltage varies according to contrast control level • Recommended range of use is from 0 V to 5.5 V | <p>AC</p> |
| 30 | | <p>Chroma APC filter pin:</p> <ul style="list-style-type: none"> • Filter pin for APC detection circuit (operates for BGP period). • External R2 → larger, detection sensitivity becomes larger. (It tends to be pulled in easily but tends to be affected by noise) • Lag-lead filter is organized by R1, R2, C1 and C2 | <p>DC</p> <p>5.5 V</p> |

Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Description | Voltage |
|---------|--------------------|---|-----------------------------------|
| 31 | | <p>Subcarrier output pin:</p> <ul style="list-style-type: none"> Controls output by 0E-D4, D7 of I²C bus. There is f_{SC} output. DC: 6.1 V, AC: 350 mV[p-p] There is no f_{SC} output. DC: 1.9 V, AC: 0 mV[p-p] Recommended range of use is from -0.4 mA to +0.4 mA | f_{SC} 300 mV[p-p] DC |
| 32 | | <p>Killer filter pin:</p> <ul style="list-style-type: none"> Filter pin for killer detection circuit (operates for BGP period) High: Killer on (B&W) Low: Killer on (color) | DC |
| 33 | | <p>ABL/ACL pin:</p> <ul style="list-style-type: none"> Apply voltage inversely proportional to brightness of CRT screen. Operating range is 7 V to 2 V Controls contrast and brightness in inverse proportion to applied voltage Recommended range of use is from 0 V to V_{CC1} | DC |
| 34 | | <p>Black extension start adjusting pin:</p> <ul style="list-style-type: none"> When current flowing out of this pin becomes larger, black extension start point comes closer to white side. Recommended range of use is from -0.4 mA to +0.1 mA | DC |
| 35 | | <p>Black level detection filter pin:</p> <ul style="list-style-type: none"> Adjusts black level detection area Recommended range of use is from 0 V to 8 V | DC |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Description | Voltage |
|---------|--------------------|---|-----------------------------|
| 36 | | <p>Chroma signal input pin:</p> <ul style="list-style-type: none"> • 2 V[p-p] composite signal in using H.P.F. of IC inside. • Chroma signal of burst = 150 mV[p-p] at externally separating Y/C. | <p>AC</p> |
| 37 | | <p>V_{CC1} reference voltage pin:</p> <ul style="list-style-type: none"> • Reference voltage circuit for generating 9 V power supply. • Recommended range of use is from 1.5 mA to 4.5 mA | <p>DC</p> <p>9.6 V</p> |
| 38 | <p>—</p> | <p>Power supply pin V_{CC1}:</p> <ul style="list-style-type: none"> • Power supply for chroma, video, RGB and AVSW. • Recommended range of use (typ.: 9 V) | <p>DC</p> |
| 39 | | <p>Capacitor pin for Y clamp:</p> <ul style="list-style-type: none"> • Clamps the pedestal level of Y signal. • Place clamp capacitor close to pin. | <p>DC</p> |
| 40 | | <p>DAC output pin 2:</p> <ul style="list-style-type: none"> • Output voltage is adjustable in 128 stages (7-bit organization) by I²C sub-address (0C). • External circuit should be high impedance | <p>DC</p> <p>0 V to 5 V</p> |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Description | Voltage |
|---------|--------------------|--|-------------------|
| 41 | | <p>Y signal input pin:</p> <ul style="list-style-type: none"> • Video signal input pin. • Input 2 V[p-p] signal. | <p>AC</p> |
| 42 | | <p>Y signal APL detection filter pin:</p> <ul style="list-style-type: none"> • Current flows out according to APL and is smoothed by external CR to generate DC voltage. | <p>DC</p> |
| 43 | | <p>SCL pin (for I²C bus):</p> <ul style="list-style-type: none"> • Low-level input: 1.5 V or less • High-level input: 3.0 V or more • Recommended range of use is from 0 V to V_{CC2} | <p>AC (Pulse)</p> |
| 44 | | <p>SDA pin (for I²C bus):</p> <ul style="list-style-type: none"> • Low-level input: 1.5 V or less • High-level input: 3.5 V or more • ACK sink capability: 3 mA • Recommended range of use is from 0 V to V_{CC} | <p>AC (Pulse)</p> |
| 45 | | <p>Killer output pin:</p> <ul style="list-style-type: none"> • Output pin of killer detection circuit • Output logic <ul style="list-style-type: none"> At color: Low At B&W: High <p>However, if 0E-D4 is set at "1" by I²C bus, output becomes open.</p> <ul style="list-style-type: none"> • Recommended range of use is from -300 μA to +300 μA | <p>DC</p> |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Description | Voltage |
|---------|--------------------|---|-----------|
| 46 | | <p>Video signal input pin 3:</p> <ul style="list-style-type: none"> • Video signal input pin • Typical input 1.0 V[p-p] • Input should be done through capacitor, and sync. top is clamped at 2.0 V. • Video signal should be inputted in low impedance | <p>AC</p> |
| 47 | — | <p>Power supply pin (V_{CC2}: 5 V):</p> <ul style="list-style-type: none"> • I²C • To be used for sync. block • Using range from 4.75 V to 5.25 V (typ.: 5 V) | DC |
| 48 | | <p>Video signal input pin 2:</p> <ul style="list-style-type: none"> • Video signal input pin • Typical input 1.0 V[p-p] • Input should be done through capacitor, and sync. top is clamped at 2.0 V. • Video signal should be inputted in low impedance | <p>AC</p> |

Note) 1. Do not apply external currents or voltages to any pins not specifically mentioned.

For circuit currents, '+' denotes current flowing into the IC, and '-' denotes current flowing out of the IC.

2. The following pins are not resistant to surge so that the precautions should be observed when using this IC.

The + side surge withstanding voltage for pin 15, pin 16 and pin 18 is approximately 200 V when a surge source capacitance is 200 pF. Do not apply a surge voltage higher than that.

■ Application Circuit Example

