

AN3501NFBP

Luminance, chroma and linear audio signal processing IC for VCR

■ Overview

The AN3501NFBP is a luminance, chroma signal processing IC for VCR (PAL and NTSC). It also integrates a playback equalizer and an NTSC playback circuit.

A normal audio signal recording/playback circuit is added so as to design a signal processing PCB in common for both a HiFi and a normal model, resulting in space saving of equipment.

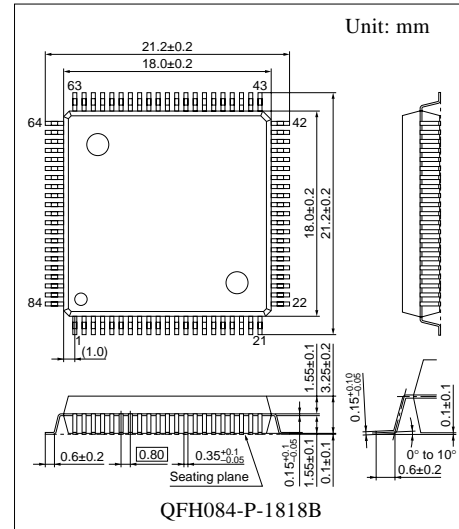
This IC is a completely adjustment-free device which has been realized by introducing an adjustment-free technology such as a Zener zap, and contributes to a more efficient design/development and production of an equipment.

■ Features

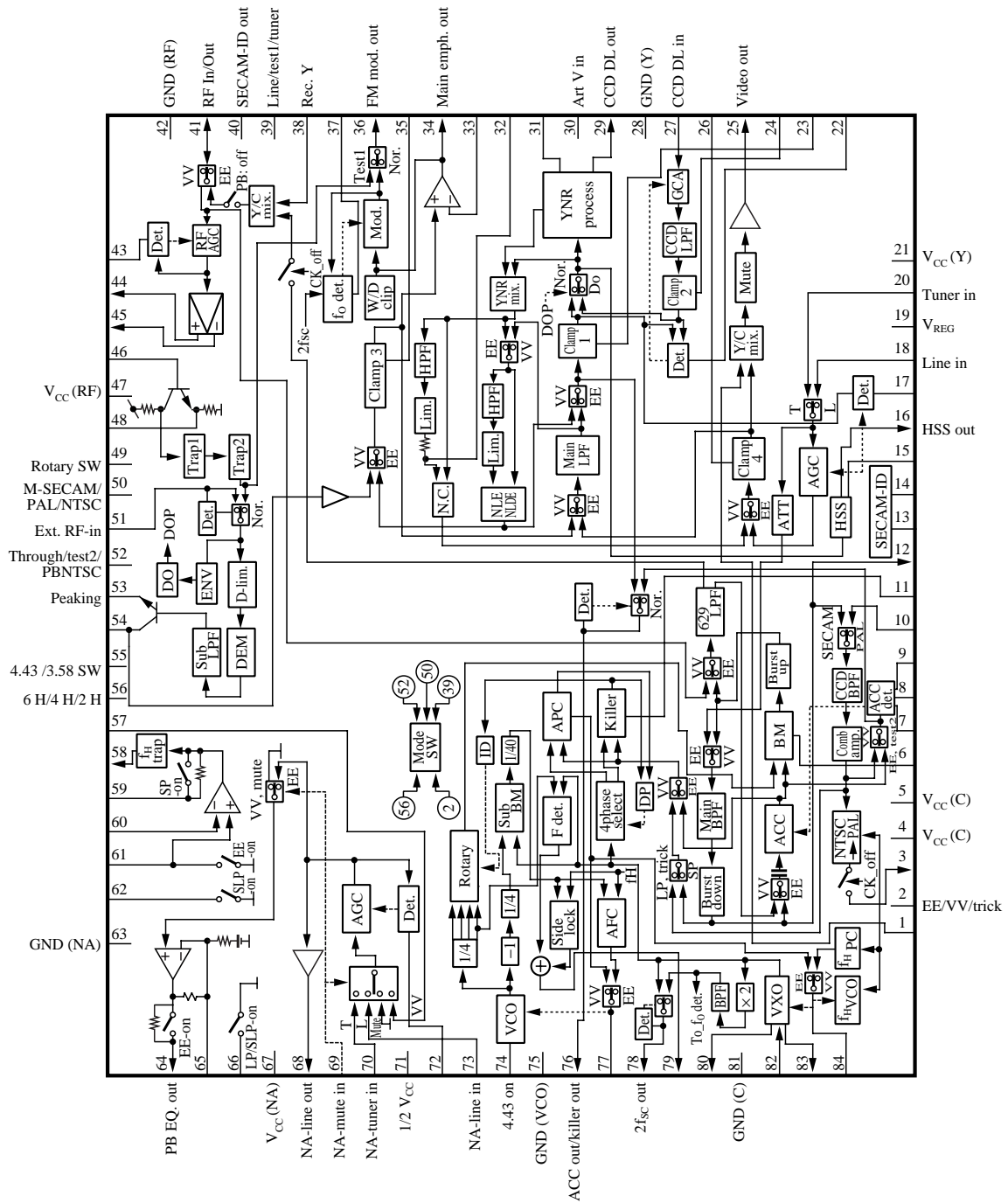
- Supply voltage range 4.8 V to 5.2 V (600 mW typ.)
 - Usable for 4.43 MHz/3.58 MHz systems
 - 4.43 MHz system: PAL/NTSC/ME-SECAM
 - 3.58 MHz system: NTSC/PAL-N
- Adjustment-free
 - Video output level (recording mode)
 - Video output level (playback mode)
 - White clip level
 - f_O frequency: sync. tip frequency
 - FM deviation
 - FM level (recording mode)
 - Chroma level (recording mode)
- Normal audio circuit built in
- NTSC to PAL conversion by adopting a simplified NTSC playback circuit of a line skip method.
- ME-SECAM discrimination circuit built-in
- All filters built-in, including a CCD filter
- The upper part flicker suppression by adoption of an ACC circuit by the field and an adaptive APC circuit

■ Applications

- VCR, camera recorder, combined CTV/VCR set



■ Block Diagram



■ Pin Descriptions

| Pin No. | Description | Pin No. | Description |
|---------|-------------------------------|---------|---------------------------------|
| 1 | Y/C mix. chroma input pin | 38 | Rec. Y-mix. in |
| 2 | EE/VV/trick changeover | 39 | Line/test1/tuner changeover |
| 3 | PB chroma output | 40 | SECAM-ID out |
| 4 | Chroma $V_{CC(1)}$ | 41 | RF In/Out |
| 5 | Chroma $V_{CC(2)}$ | 42 | RF GND |
| 6 | BM DC det. | 43 | RF AGC det./EE edit high |
| 7 | ACC det. | 44 | Phase shift pos. |
| 8 | F. ACC det. (ROT: high) | 45 | Phase shift neg. |
| 9 | F. ACC det. (ROT: low) | 46 | Phase shift in |
| 10 | C comb filter input | 47 | RF V_{CC} |
| 11 | Killer det. | 48 | RF EQ. peaking/SQPB high |
| 12 | C comb filter output | 49 | Rotary in |
| 13 | SECAM det. 1 | 50 | M-SECAM/PAL/NTSC changeover |
| 14 | SECAM det. 2 | 51 | Ext. RF in |
| 15 | Sync. sepa. det. | 52 | Through/test2/PBNTSC changeover |
| 16 | HSS out | 53 | Peaking |
| 17 | AGC det. | 54 | Main de-emphasis |
| 18 | Line in | 55 | 4.43 MHz/3.58 MHz changeover |
| 19 | V_{REG} (2.0 V) | 56 | SLP/LP/SP changeover |
| 20 | Tuner in | 57 | NA-PB amp. in |
| 21 | Lumi. V_{CC} | 58 | NA-PB EQ. out |
| 22 | CCD AGC det. | 59 | NA-PB EQ. SW |
| 23 | Sub clamp det. 1 | 60 | NA-PB NF |
| 24 | Sub clamp det. 2 | 61 | NA-PB in |
| 25 | Video out | 62 | NA-PB in EQ./SLP |
| 26 | Sub clamp det. 4 | 63 | NA GND |
| 27 | CCD DL in | 64 | NA-rec. out |
| 28 | Lumi. GND | 65 | NA-rec. EQ. NF |
| 29 | CCD DL out | 66 | NA-rec. EQ. LP/SLP |
| 30 | Quasi-sync. pulse input | 67 | NA V_{CC} |
| 31 | YNR lim. DC | 68 | NA-line out |
| 32 | N.C. LPF | 69 | NA-mute in |
| 33 | Main emph. FB in/VV edit high | 70 | NA-tuner in |
| 34 | Main emph. out | 71 | 1/2 V_{CC} |
| 35 | Sub clamp det. 3 | 72 | NA-AGC det. |
| 36 | FM mod. out | 73 | NA-line in |
| 37 | f_O det. | 74 | VCO f_O |

■ Pin Descriptions (continued)

| Pin No. | Description | Pin No. | Description |
|---------|----------------------|---------|----------------------------------|
| 75 | VCO GND | 80 | XO/VCXO out |
| 76 | ACC out/killer out | 81 | C GND |
| 77 | Rec. AFC/PB APC det. | 82 | XO/VCXO in |
| 78 | 2f _{SC} out | 83 | XO/VCXO out |
| 79 | Side lock det. | 84 | Rec. APC/f _H AFC det. |

■ Absolute Maximum Ratings

| Parameter | Symbol | Rating | Unit |
|----------------------------------|------------------|-------------|------|
| Supply voltage | V _{CC} | 5.5 | V |
| Supply current | I _{CC} | 175 | mA |
| Power dissipation *2 | P _D | 660 | mW |
| Operating ambient temperature *1 | T _{opr} | -20 to +70 | °C |
| Storage temperature *1 | T _{stg} | -25 to +125 | °C |

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

*2: The power dissipation shown is for the IC package at T_a = 70°C

■ Recommended Operating Range

| Parameter | Symbol | Range | Unit |
|----------------|-----------------|------------|------|
| Supply voltage | V _{CC} | 4.8 to 5.2 | V |

■ Electrical Characteristics at V_{CC} = 5 V, T_a = 25°C

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|------------------|---------------------------------------|------|-----|------|------|
| DC characteristics | | | | | | |
| Supply current (EE) | I _{CCR} | V _{CC} = 5 V, EE mode | 92 | 117 | 144 | mA |
| Supply current (VV) | I _{CCP} | V _{CC} = 5 V, VV mode | 105 | 133 | 164 | mA |
| High mode hold voltage | V _H | Pin 2, pin 39, pin 50, pin 52, pin 56 | 3.5 | — | 5.0 | V |
| Middle mode hold voltage | V _M | Pin 2, pin 39, pin 50, pin 52, pin 56 | 1.75 | — | 3.0 | V |
| Low mode hold voltage | V _L | Pin 2, pin 39, pin 50, pin 52, pin 56 | 0 | — | 1.25 | V |
| Sync. level insertion mode hold voltage | V _{30H} | | 3.5 | — | 5.0 | V |
| Gray level insertion mode hold voltage | V _{30M} | | 1.5 | — | 3.0 | V |
| Through mode hold voltage | V _{30L} | | 0 | — | 1.0 | V |
| Rotary SWH hold voltage | V _{49H} | | 3.5 | — | 5.0 | V |
| Rotary SWL hold voltage | V _{49L} | | 0 | — | 1.25 | V |
| 4.43 MHz mode hold voltage | V _{55H} | | 1.75 | — | 5.0 | V |
| 3.58 MHz mode hold voltage | V _{55L} | | 0 | — | 1.25 | V |

■ Electrical Characteristics at $V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$ (continued)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|--|--------------------|--|-------|------|-------|---------------|
| DC characteristics (continued) | | | | | | |
| Audio mute hold voltage | V_{69H} | | 3.5 | — | 5.0 | V |
| Audio through hold voltage | V_{69L} | | 0 | — | 1.25 | V |
| After-recording mode hold voltage | V_{70H} | | 4.0 | — | 5.0 | V |
| Insertion mode hold voltage | V_{70L} | | 0 | — | 1.0 | V |
| VV edit mode hold voltage | V_{33H} | | 4.0 | — | 5.0 | V |
| EE edit mode hold voltage | V_{43H} | | 4.0 | — | 5.0 | V |
| SQPB mode hold voltage | V_{48H} | | 3.25 | — | 5.0 | V |
| Luminance recording system | | | | | | |
| AGC characteristics | ΔV_{18-25} | White 100%, $V_{IN} = [2.0\text{ V[p-p]}/[0.5\text{ V[p-p]}]$ | -0.5 | 0.5 | 1.0 | dB |
| EE out amplitude (PAL) | V_{20-25P} | White 100%, V: S = 7: 3, $V_{IN} = 1\text{ V[p-p]}$ | 1.995 | 2.1 | 2.205 | V[p-p] |
| AGC frequency characteristics | f_{20-25} | $f_{IN} = 5\text{ MHz}/1\text{ MHz}$ | -2.0 | -0.5 | 0.5 | dB |
| AGC output level ratio | ΔV_{20-25} | White 140%, 1.28 V[p-p], Ratio to V_{20-25P} | 0.05 | 0.55 | 1.25 | dB |
| EE out amplitude (NTSC) | V_{20-25N} | White 100%, $V = 0.714\text{ V[p-p]}$, $V_{IN} = 1\text{ V[p-p]}$ | 1.9 | 2.1 | 2.3 | V[p-p] |
| MLPF frequency characteristics 1 | $f_{18-76(1)}$ | 4.43 MHz mode, $V_{IN} = 100\text{ mV[p-p]}$ $f_{IN} = 2\text{ MHz}/0.15\text{ MHz}$ | -1.7 | 0.1 | 0.9 | dB |
| MLPF frequency characteristics 2 | $f_{18-76(2)}$ | 4.43 MHz mode, $V_{IN} = 100\text{ mV[p-p]}$ $f_{IN} = 3\text{ MHz}/0.15\text{ MHz}$ | -4.2 | -2.2 | -0.7 | dB |
| MLPF frequency characteristics 3 | $f_{18-76(3)}$ | 4.43 MHz mode, $V_{IN} = 100\text{ mV[p-p]}$ $f_{IN} = 4.43\text{ MHz}/0.15\text{ MHz}$ | — | -35 | -30 | dB |
| MLPF frequency characteristics 4 | $f_{18-76(4)}$ | 3.58 MHz mode, $V_{IN} = 100\text{ mV[p-p]}$ $f_{IN} = 2.2\text{ MHz}/0.15\text{ MHz}$ | -4.8 | -1.8 | 0.2 | dB |
| MLPF frequency characteristics 5 | $f_{18-76(5)}$ | 3.58 MHz mode, $V_{IN} = 100\text{ mV[p-p]}$ $f_{IN} = 3.58\text{ MHz}/0.15\text{ MHz}$ | — | -39 | -27 | dB |
| Sync. separation minimum input sensitivity | S_{16} | White 100%, $V_{IN} = 0.145\text{ V[p-p]}$, Pin 76 amplitude | 23 | 30 | 37 | % |
| Sync. separation output pulse front-edge delay | T_{16} | White 100%, $V_{IN} = 1.0\text{ V[p-p]}$, including LPF | 1.14 | 1.34 | 1.54 | μs |
| Sync. separation low-level output pulse | V_{16L} | $R_L (V_{CC}) = 10\text{ k}\Omega$ | — | — | 0.7 | V |
| Sync. separation high-level output pulse | V_{16H} | $R_L (\text{GND}) = 22\text{ k}\Omega$ | 4.5 | — | — | V |
| Vertical emph. 1-K value gain 1 | $G_{76-29(1)}$ | $V_{76} = 400\text{ mV[p-p]}$, LP, $f_{IN} = 150\text{ kHz}$ | -3.0 | -1.5 | 0 | dB |
| Vertical emph. 1-K value gain 2 | $G_{76-29(2)}$ | $V_{76} = 400\text{ mV[p-p]}$, LP, $f_{IN} = 2\text{ MHz}$ | -1.5 | 0 | 1.5 | dB |
| Vertical emph. difference signal amplitude | ΔV_{VE} | White 100%, 1 V[p-p] | — | 30 | 100 | mV[p-p] |

■ Electrical Characteristics at $V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$ (continued)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|------------------|---|-------|-------|-------|---------|
| Luminance recording system (continued) | | | | | | |
| Vertical emph. X value gain | G_{31-33} | $V_{IN} = 40\text{ mV[p-p]}$, $f_{IN} = 150\text{ kHz}$ | -18.5 | -15.0 | -11.5 | dB |
| CCD input output level | V_{29} | $V_{IN} = 1\text{ V[p-p]}$, white 100% | 375 | 405 | 440 | mV[p-p] |
| NL emphasis/detail enhancer frequency characteristics 1 | $G_{NE(1)}$ | SP/edit: $V_{76} = -20\text{ dB}$, $f_{IN} = 500\text{ kHz}/150\text{ kHz}$ | 0.4 | 1.2 | 2.0 | dB |
| NL emphasis/detail enhancer frequency characteristics 2 | $G_{NE(2)}$ | SP/edit: $V_{76} = -20\text{ dB}$, $f_{IN} = 2\text{ MHz}/150\text{ kHz}$ | 1.7 | 2.9 | 4.1 | dB |
| NL emphasis/detail enhancer frequency characteristics 3 | $G_{NE(3)}$ | SP/normal: $V_{76} = -20\text{ dB}$, $f_{IN} = 500\text{ kHz}/150\text{ kHz}$ | 1.1 | 2.1 | 3.1 | dB |
| NL emphasis/detail enhancer frequency characteristics 4 | $G_{NE(4)}$ | SP/normal: $V_{76} = -20\text{ dB}$, $f_{IN} = 2\text{ MHz}/150\text{ kHz}$ | 3.2 | 4.7 | 6.2 | dB |
| NL emphasis/detail enhancer frequency characteristics 5 | $G_{NE(5)}$ | LP: $V_{76} = -20\text{ dB}$, $f_{IN} = 500\text{ kHz}/150\text{ kHz}$ | 2.54 | 3.84 | 5.14 | dB |
| NL emphasis/detail enhancer frequency characteristics 6 | $G_{NE(6)}$ | LP: $V_{76} = -20\text{ dB}$, $f_{IN} = 2\text{ MHz}/150\text{ kHz}$ | 3.9 | 5.9 | 7.9 | dB |
| NL emphasis/detail enhancer frequency characteristics 7 | $G_{NE(7)}$ | LP: $V_{76} = 0\text{ dB}$, $f_{IN} = 2\text{ MHz}/150\text{ kHz}$ | 0.2 | 0.9 | 1.6 | dB |
| Main emphasis gain | G_{ME} | $1\text{ k}\Omega/220+0.1\text{ }\mu\text{F}$, $f_{IN} = 150\text{ kHz}$ | 13 | 15 | 17 | dB |
| Main emphasis standard output level | V_{ME} | White 100%, 1 V[p-p] | 350 | 400 | 450 | mV[p-p] |
| White clip level | LV_{WC} | White 100% | 176 | 183 | 190 | % |
| Dark clip level | LV_{DC} | White 100% | 43 | 55 | 65 | % |
| FM mod. output frequency (4.43 PAL) | f_{36P} | No input 4.43 MHz mode, PAL mode | 3.75 | 3.81 | 3.85 | MHz |
| FM mod. output frequency (4.43 NTSC) | $f_{36N(1)}$ | No input 4.43 MHz mode, NTSC mode | 3.37 | 3.47 | 3.57 | MHz |
| FM mod. output frequency (3.58 NTSC) | $f_{36N(2)}$ | No input 3.58 MHz mode, NTSC mode | 3.29 | 3.39 | 3.49 | MHz |
| FM mod. output secondary distortion (PAL) | $2f_{36P}$ | No input PAL mode | — | -45 | -35 | dB |
| FM mod. deviation (PAL) | D_{36P} | White 100% | 0.95 | 1.0 | 1.05 | MHz |
| FM mod. deviation (NTSC) | D_{36N} | White 100% | 0.9 | 1.0 | 1.1 | MHz |
| Rec. FM total output amplitude (PAL) | V_{FM} | $V_{36}/4 \times G_{38-41}$, V_{36} : pin 36 amplitude | 332.5 | 350 | 367.5 | mV[p-p] |
| Rec. FM amp. frequency characteristics | f_{38-41} | 10 MHz/4 MHz | -2.5 | -0.5 | 0.5 | dB |
| Luminance playback system | | | | | | |
| FM demodulation sensitivity (VHS) | ΔV_{53V} | Pin 51 input, $f_{IN} = 3.8\text{ MHz}$, 4.8 MHz | 0.13 | 0.175 | 0.22 | V/MHz |
| FM demodulation sensitivity (SQPB) | ΔV_{53S} | Pin 51 input, $f_{IN} = 5.4\text{ MHz}$, 7.0 MHz | 0.13 | 0.175 | 0.22 | V/MHz |

■ Electrical Characteristics at $V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$ (continued)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|-------------------|--|-------|------|-------|---------------|
| Luminance playback system (continued) | | | | | | |
| PB output amplitude | V_{PB} | Pin 51 input, $f_{IN} = 3.8\text{ MHz}$, 4.8 MHz | 1.995 | 2.1 | 2.205 | V[p-p] |
| Drop out detect SW on level | S_{51} | $f_{IN} = 4\text{ MHz}$, $0\text{ dB} = 350\text{ mV[p-p]}$ | -22 | -18 | -14 | dB |
| Drop out detect hysteresis | ΔS_{51} | $f_{IN} = 4\text{ MHz}$, $0\text{ dB} = 350\text{ mV[p-p]}$ | 1.0 | 3.0 | 5.0 | dB |
| Env. detect SW operating time | T_{ENV} | AM wave 1 kHz , $V_{IN} = 350\text{ mV}$, $f_{IN} = 4\text{ MHz}$ | 180 | 224 | 270 | μs |
| NL de-emphasis frequency characteristics 1 | $G_{ND(1)}$ | SP: $V_{IN} = -20\text{ dB}$, $f_{IN} = 500\text{ kHz}/150\text{ kHz}$ | -2.7 | -1.7 | -0.7 | dB |
| NL de-emphasis frequency characteristics 2 | $G_{ND(2)}$ | SP: $V_{IN} = -20\text{ dB}$, $2\text{ MHz}/150\text{ kHz}$ | -5.5 | -4.2 | -3.0 | dB |
| NL de-emphasis frequency characteristics 3 | $G_{ND(3)}$ | LP: $V_{IN} = -20\text{ dB}$, $f_{IN} = 500\text{ kHz}/150\text{ kHz}$ | -6.2 | -3.9 | -2.2 | dB |
| NL de-emphasis frequency characteristics 4 | $G_{ND(4)}$ | LP: $V_{IN} = -20\text{ dB}$, $2\text{ MHz}/150\text{ kHz}$ | -9.0 | -7.5 | -6.2 | dB |
| NL de-emphasis frequency characteristics 5 | $G_{ND(5)}$ | LP: $V_{IN} = 0\text{ dB}$, $2\text{ MHz}/150\text{ kHz}$ | -2.7 | -2.0 | -1.3 | dB |
| YNR 1-K value gain EDNC | G_{54-29E} | White 100% , $V_{IN} = 160\text{ mV[p-p]}$ | 4.5 | 6.0 | 7.5 | dB |
| YNR 1-K value gain VNC | G_{54-29V} | White 100% , $V_{IN} = 160\text{ mV[p-p]}$ | 1.8 | 3.3 | 4.8 | dB |
| YNR difference element amplitude EDNC | ΔV_{EDNC} | Rectangular wave, $V_{IN} = 160\text{ mV[p-p]}$ | — | 30 | 100 | mV[p-p] |
| YNR difference element amplitude VNC | ΔV_{VNC} | Rectangular wave, $V_{IN} = 160\text{ mV[p-p]}$ | — | 10 | 100 | mV[p-p] |
| YNR X value gain EDNC | G_{31-25E} | $V_{IN} = 40\text{ mV[p-p]}$, $f_{IN} = 150\text{ kHz}$ | -4.9 | -2.9 | -1.3 | dB |
| YNR X value gain VNC | G_{31-25V} | $V_{IN} = 40\text{ mV[p-p]}$, $f_{IN} = 150\text{ kHz}$ | 0.6 | 2.1 | 3.6 | dB |
| YNR lim. (VNC) output level 1 | $V_{25YL(1)}$ | $V_{IN} = 800\text{ mV[p-p]}$, $f_{IN} = 150\text{ kHz}$ | 26 | 40 | 53 | mV[p-p] |
| YNR lim. (VNC) output level 2 | $V_{25YL(2)}$ | $V_{IN} = 300\text{ mV[p-p]}$, $f_{IN} = 150\text{ kHz}$ | 13.5 | 25.0 | 37.0 | mV[p-p] |
| YNR lim. (VNC) output level 3 | $V_{25YL(3)}$ | $V_{IN} = 100\text{ mV[p-p]}$, $f_{IN} = 150\text{ kHz}$ | 80 | 110 | 140 | mV[p-p] |
| CCD AGC cover range | ΔV_{31} | $V_{54} = 160\text{ mV[p-p]}$, rectangular wave, CCD Gain $\pm 3\text{ dB}$ | 0 | 30 | 100 | mV[p-p] |
| Noise canceller frequency characteristics 1 | $G_{25N(1)}$ | Normal mode, $V_{27} = -30\text{ dB}$, Including CCD LPF, $f_{IN} = 1\text{ MHz}/150\text{ kHz}$ | -13.0 | -8.0 | -4.8 | dB |
| Noise canceller frequency characteristics 2 | $G_{25N(2)}$ | Normal mode, $V_{27} = -30\text{ dB}$, Including CCD LPF, $f_{IN} = 2\text{ MHz}/150\text{ kHz}$ | -9.3 | -4.5 | -2.3 | dB |
| Noise canceller frequency characteristics 3 | $G_{25N(3)}$ | Normal mode, $V_{27} = 0\text{ dB}$, Including CCD LPF, $f_{IN} = 2\text{ MHz}/150\text{ kHz}$ | -0.8 | 1.2 | 2.7 | dB |
| Noise canceller frequency characteristics 4 | $G_{25N(4)}$ | Edit mode, $V_{27} = -30\text{ dB}$, Including CCD LPF, $f_{IN} = 2\text{ MHz}/150\text{ kHz}$ | -0.3 | -1.0 | 0.5 | dB |
| Video output sync. DC level | ΔV_{SYNC} | White 100% , $V_{27} = 317\text{ mV[p-p]}$ | 0.8 | 0.95 | 1.1 | V |
| Video output quasi-V offset voltage | ΔV_{25A} | $V_{30} = 5\text{ V}$ | -30 | 0 | 60 | mV |
| Video output quasi-H offset voltage | ΔV_{25G} | $V_{30} = 2.5\text{ V}$ | 0.85 | 1.0 | 1.15 | V |

■ Electrical Characteristics at $V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$ (continued)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---------------------------------------|-------------------|--|-------|-------|------|---------|
| Luminance playback system (continued) | | | | | | |
| Chroma mix. output gain | G_{1-25} | $V_{IN} = 600\text{ mV[p-p]}$, $f_{IN} = 5\text{ MHz}$ | 4.9 | 6.6 | 8.3 | dB |
| Chroma mix. frequency characteristics | f_{1-25} | $V_{IN} = 600\text{ mV[p-p]}$, $f_{IN} = 5\text{ MHz}/1\text{ MHz}$ | -0.5 | 0.3 | 1.0 | dB |
| RF-AGC output amplitude | V_{41-45} | $V_{IN} = 200\text{ mV[p-p]}$, $f = 4\text{ MHz}$ | 170 | 215 | 265 | mV[p-p] |
| RF-AGC sensitivity | S_{RF} | $\pm 6\text{ dB input}$ | — | 0.5 | 3.0 | dB |
| RF-AGC output distortion | D_{RF} | $V_{IN} = 400\text{ mV[p-p]}$, $f = 4\text{ MHz}$ | — | -44 | -35 | dB |
| RF-AGC maximum gain | G_{RFAGC} | $V_{IN} = 20\text{ mV[p-p]}$, $f = 4\text{ MHz}$ | 8.5 | 10.5 | 12.5 | dB |
| RF-EQ. frequency characteristics 2 | GEQ2 | $V_{IN} = 20\text{ mV[p-p]}$, $f = 1\text{ MHz}/5\text{ MHz}$ | -24.0 | -15.0 | -9.0 | dB |
| RF-EQ. frequency characteristics 3 | GEQ3 | $f = 2\text{ MHz}/5\text{ MHz}$ | -9.8 | -5.3 | -3.3 | dB |
| RF-EQ. frequency characteristics 4 | GEQ4 | $f = 630\text{ kHz}/5\text{ MHz}$ | — | -30 | -15 | dB |
| RF-EQ. frequency characteristics 5 | GEQ5 | $f = 8\text{ MHz}/5\text{ MHz}$ | — | -30 | -15 | dB |
| RF-EQ. total characteristics | V_{41-36} | $V_{IN} = 200\text{ mV[p-p]}$ | 305 | 435 | 605 | mV[p-p] |
| Chroma recording system | | | | | | |
| Output DC for color | V_{76CO} | Color, $V_{11} = 3.5\text{ V}$ | 3.5 | — | — | V |
| Output DC for killer | V_{76CK} | Killer, $V_{11} = 1.5\text{ V}$ | — | — | 0.5 | V |
| Burst up gain | G_{BUP} | $V_{IN} = 1: 1$ ($B = 300\text{ mV[p-p]}$) | 5 | 6 | 7 | dB |
| Rec. APC pull in range 1 | $f_{APC(1)}$ | 4.43 MHz mode, $f_{IN} = f_{SC} + 500\text{ Hz}$ | 500 | 800 | — | Hz |
| Rec. APC pull in range 2 | $f_{APC(2)}$ | 4.43 MHz mode, $f_{IN} = f_{SC} - 500\text{ Hz}$ | — | -800 | -500 | Hz |
| Rec. APC pull in range 3 | $f_{APC(3)}$ | 3.58 MHz mode, $f_{IN} = f_{SC} + 500\text{ Hz}$ | 500 | 800 | — | Hz |
| Rec. APC pull in range 4 | $f_{APC(4)}$ | 3.58 MHz mode, $f_{IN} = f_{SC} - 500\text{ Hz}$ | — | -800 | -500 | Hz |
| VXO free-run frequency 1 | $f_{VXO(1)}$ | 4.43 MHz mode, SECAM mode | -100 | 0 | 100 | Hz |
| VXO free-run frequency 2 | $f_{VXO(2)}$ | 3.58 MHz mode, SECAM mode | -100 | 0 | 100 | Hz |
| Rec. chroma output amplitude | V_{CR} | B: C = 1: 2 chroma level | 75.6 | 82 | 88.4 | mV[p-p] |
| ACC characteristics 1 | ΔV_{ACC1} | $V_{IN} = 1: 1$, +9, -5 dB, $V_{49} = 5\text{ V}$ | — | — | 3 | dB |
| ACC characteristics 2 | ΔV_{ACC2} | $V_{IN} = 1: 1$, +9, -5 dB, $V_{49} = 0\text{ V}$ | — | — | 3 | dB |
| 630k LPF frequency characteristics 1 | $f_{RL(1)}$ | 4.43 MHz mode, $V_{IN} = 200\text{ mV[p-p]}$, 150 kHz/630 kHz | -0.7 | 0.3 | 1.3 | dB |
| 630k LPF frequency characteristics 2 | $f_{RL(2)}$ | 4.43 MHz mode, $V_{IN} = 200\text{ mV[p-p]}$, 3 MHz/630 kHz | — | -25 | -15 | dB |
| 630k LPF frequency characteristics 3 | $f_{RL(3)}$ | 4.43 MHz mode, $V_{IN} = 200\text{ mV[p-p]}$, 4.43 MHz/630 kHz | — | -35 | -20 | dB |
| 630k LPF group delay | GD_{RL} | 4.43 MHz mode, $V_{IN} = 200\text{ mV[p-p]}$, $f_{IN} = 630\text{ kHz}$ | 310 | 360 | 410 | ns |
| 630k LPF frequency characteristics 4 | $f_{RL(4)}$ | 3.58 MHz mode, $V_{IN} = 200\text{ mV[p-p]}$, 2 MHz/630 kHz | -2.0 | 0 | 2.0 | dB |
| SECAM discrimination output DC 1 | $V_{40(1)}$ | 4.43 MHz mode, PAL mode, $f_{IN} = 4.43\text{ MHz}$ | 0 | — | 0.65 | V |
| SECAM discrimination output DC 2 | $V_{40(2)}$ | 4.43 MHz mode, SECAM mode, $f_{IN} = 4.25\text{ MHz}, 4.41\text{ MHz}$ | 4 | — | 5 | V |

■ Electrical Characteristics at $V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$ (continued)

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|-----------------|---|------|------|------|---------|
| Chroma playback system | | | | | | |
| Comb amp. gain SP | G_{MB} | SP mode, $f_{SC} = 4.43\text{ MHz}$ | 1.3 | 3.3 | 5.3 | dB |
| Comb amp. gain LP | ΔG_{MB} | Difference from EP mode and SP mode | 0.6 | 1.6 | 2.6 | dB |
| Burst down gain 1 | $G_{BD(1)}$ | $V_{IN} = 1: 1$ ($B = 440\text{ mV[p-p]}$), NTSC/SP mode | -6.2 | -5.2 | -4.2 | dB |
| Main BM carrier leak | G_{CL} | $V_{IN} = 250\text{ mV[p-p]}$, $f_{IN} = 630\text{ kHz}$ without signal | — | -45 | -38 | dB |
| Main BM signal leak | G_{SL} | $V_{IN} = 250\text{ mV[p-p]}$, $f_{IN} = 630\text{ kHz}$ | — | -55 | -38 | dB |
| XO free-run frequency 1 | $f_{XO(1)}$ | 4.43 MHz mode, $1/2 \times f_{78}$ | -50 | — | 50 | Hz |
| XO free-run frequency 2 | $f_{XO(2)}$ | 3.58 MHz mode, $1/2 \times f_{78}$ | -50 | — | 50 | Hz |
| $2f_{SC}$ output level 1 | $V_{2fsc(1)}$ | 4.43 MHz mode | 240 | 370 | 500 | mV[p-p] |
| $2f_{SC}$ output level 2 | $V_{2fsc(2)}$ | 3.58 MHz mode | 260 | 400 | 540 | mV[p-p] |
| f_{SC} output level 1 | $V_{fsc(1)}$ | 4.43 MHz mode | 300 | 370 | 500 | mV[p-p] |
| f_{SC} output level 2 | $V_{fsc(2)}$ | 3.58 MHz mode | 300 | 420 | 560 | mV[p-p] |
| 630 k BPF gain 1 | $G_{PB(1)}$ | 4.43 MHz mode, $V_{IN} = 10\text{ mV[p-p]}$, $f_{IN} = 630\text{ kHz}$ | 25 | 30 | 35 | dB |
| 630k BPF frequency characteristics 1 | $f_{PB(1)}$ | 4.43 MHz mode, $V_{IN} = 10\text{ mV[p-p]}$, $f_{IN} = 150\text{ kHz}/630\text{ kHz}$ | -5.0 | -2.0 | -0.5 | dB |
| 630k BPF frequency characteristics 2 | $f_{PB(2)}$ | 4.43 MHz mode, $V_{IN} = 10\text{ mV[p-p]}$, $f_{IN} = 930\text{ kHz}/630\text{ kHz}$ | -4 | -2.0 | -0.5 | dB |
| 630k BPF frequency characteristics 3 | $f_{PB(3)}$ | 4.43 MHz mode, $V_{IN} = 10\text{ mV[p-p]}$, $f_{IN} = 2.4\text{ MHz}/630\text{ kHz}$ | — | -40 | -30 | dB |
| 630k BPF gain 2 | $G_{PB(2)}$ | 3.58 MHz mode, $f_{IN} = 630\text{ kHz}$, Difference from 4.43 MHz mode | -1.0 | 0 | 1.0 | dB |
| 630k BPF frequency characteristics 4 | $f_{PB(4)}$ | 3.58 MHz mode, $f_{IN} = 930\text{ kHz}$, Difference from 4.43 MHz mode | -2.0 | 0 | 2.0 | dB |
| f_{HVCO} pull-in range | f_{VCOmax} | $f_{IN} = f_H + 500\text{ Hz}$ | 500 | — | — | Hz |
| | f_{VCOmin} | $f_{IN} = f_H - 500\text{ Hz}$ | — | — | -500 | |
| SECAM discrimination output DC 3 | $V_{40(3)}$ | 4.43 MHz mode, SECAM mode, $f_{IN} = 0.63\text{ MHz}$ | 0 | — | 0.65 | V |
| SECAM discrimination output DC 4 | $V_{40(4)}$ | 4.43 MHz mode, PAL mode, $f_{IN} = 0.63\text{ MHz}, 0.65\text{ MHz}$ | 0 | — | 0.65 | V |
| SECAM discrimination output DC 5 | $V_{40(5)}$ | 4.43 MHz mode, SECAM mode, $f_{IN} = 0.67\text{ MHz}, 0.81\text{ MHz}$ | 4 | — | 5 | V |
| SECAM discrimination output DC 6 | $V_{40(6)}$ | 4.43 MHz mode, PAL mode, $f_{IN} = 0.65\text{ MHz}, 0.81\text{ MHz}$ | 4 | — | 5 | V |
| Audio-system | | | | | | |
| Line out gain | V_{EL} | $f = 1\text{ kHz}$, EE, -29 dBV | 22.4 | 23.6 | 24.8 | dB |
| Rec. out level ratio at SP | V_{ER1} | $f = 1\text{ kHz}$, EE, -29 dBV, ratio to VEL | -0.2 | 0.8 | 1.8 | dB |
| Rec. out level ratio at SLP | V_{ER2} | $f = 1\text{ kHz}$, EE, -29 dBV, ratio to SP | -0.2 | 0.3 | 0.8 | dB |

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

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|-----------------------------|-------------|---|------|-----|-----|---------------------------|
| Audio-system (continued) | | | | | | |
| Rec. out distortion at LP | T_{ER1} | $f = 1 \text{ kHz}$, EE, -29 dBV | — | 0.3 | 1 | % |
| Rec. out SN SLP | N_{ER2} | EE | — | -65 | -59 | dBV |
| AGC level ratio | V_{ELA} | $f = 1 \text{ kHz}$, -9 dBV | — | 0.3 | 3 | dB |
| Line out distortion | T_{EL} | $f = 1 \text{ kHz}$, -29 dBV | — | 0.3 | 1 | % |
| Rec. out max. level | V_{ERMAX} | $f = 1 \text{ kHz}$, amplitude for distortion = 1% | -0.5 | — | — | dBV |
| PB gain SP | V_{VL1} | $f = 1 \text{ kHz}$, -68.3 dBV | 61 | 62 | 63 | dB |
| PB level ratio SLP | V_{VL2} | $f = 1 \text{ kHz}$, -70.8 dBV | — | 2 | — | dB |
| PB distortion SLP | T_{VL2} | $f = 1 \text{ kHz}$, -70.8 dBV | — | 0.5 | 1 | % |
| Noise referred to input: SP | N_{VL1} | No input signal, $R_g = 1.5 \text{ k}\Omega$ | — | — | 1.8 | $\mu\text{V}[\text{rms}]$ |
| f_H attenuation | V_{TR1} | $f = 15.625 \text{ kHz}$ | — | -15 | -5 | dB |
| Line out max. level | V_{LMAX} | $f = 1 \text{ kHz}$, amplitude for distortion = 1% | -1.5 | — | — | dBV |
| Mute attenuation | V_{ML} | $f = 1 \text{ kHz}$, PB mode | — | — | -80 | dB |

• 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 |
|-------------------------------------|---------------------|--|-------|-------|------|-------------------------|
| Luminance-system | | | | | | |
| M LPF group delay 1 | GD(1) | 4.43 MHz mode, rec., $f_{IN} = 0.15 \text{ MHz}$ | 655 | 705 | 755 | ns |
| M LPF group delay 2 | GD(2) | 3.58 MHz mode, rec., $f_{IN} = 0.15 \text{ MHz}$ | 670 | 750 | 830 | ns |
| M LPF group delay difference | ΔGD | 4.43 MHz mode, PB, $f_{IN} = 1 \text{ MHz}$, SQPB/VHS mode difference | 155 | 180 | 225 | ns |
| CCD LPF frequency characteristics 1 | $G_{27-29(1)}$ | 4.43 MHz mode, EDNC, $V_{IN} = 312 \text{ mV}[\text{p-p}]$, $f_{IN} = 3 \text{ MHz}/0.2 \text{ MHz}$ | -2.0 | 0.5 | 1.5 | dB |
| CCD LPF frequency characteristics 2 | $G_{27-29(2)}$ | 4.43 MHz mode, EDNC, $V_{IN} = 312 \text{ mV}[\text{p-p}]$, $f_{IN} = 13.3 \text{ MHz}/0.2 \text{ MHz}$ | — | -30 | -25 | dB |
| CCD LPF group delay 1 | $\text{GD}_{29(1)}$ | 4.43 MHz mode, EDNC, $V_{IN} = 312 \text{ mV}[\text{p-p}]$, $f_{IN} = 0.2 \text{ MHz}$ | 90 | 120 | 150 | ns |
| CCD LPF frequency characteristics 3 | $G_{27-29(3)}$ | 3.58 MHz mode, EDNC, $V_{IN} = 312 \text{ mV}[\text{p-p}]$, $f_{IN} = 2 \text{ MHz}/0.2 \text{ MHz}$ | -3.0 | 0.7 | 2.0 | dB |
| CCD LPF frequency characteristics 4 | $G_{27-29(4)}$ | 3.58 MHz mode, EDNC, $V_{IN} = 312 \text{ mV}[\text{p-p}]$, $f_{IN} = 7.2 \text{ MHz}/0.2 \text{ MHz}$ | — | -2.5 | -20 | dB |
| CCD LPF group delay 2 | $\text{GD}_{29(2)}$ | 3.58 MHz mode, EDNC, $V_{IN} = 312 \text{ mV}[\text{p-p}]$, $f_{IN} = 0.2 \text{ MHz}$ | 85 | 125 | 165 | ns |
| FM carrier interleave | CI_{36} | EP mode, V_{37} : fixed | 6.4 | 7.9 | 9.4 | kHz |
| FM demod min. input level | $V_{51\text{MIN}}$ | $f_{IN} = 3.8 \text{ MHz}$, 4.8 MHz | 10 | — | — | $\text{mV}[\text{p-p}]$ |
| FM demod linearity | $L_{53\text{V}}$ | $f_{IN} = 3 \text{ MHz}$, 4 MHz , 5 MHz | 0.82 | 0.92 | 1.05 | — |
| Sub LPF frequency characteristics 1 | G_{SL1} | $f_{IN} = 2 \text{ MHz}/1.5 \text{ MHz}$, $f_{OUT} = 4 \text{ MHz}/3 \text{ MHz}$ | -2.7 | -0.5 | 1.0 | dB |
| Sub LPF frequency characteristics 2 | G_{SL2} | $f_{IN} = 3 \text{ MHz}/1.5 \text{ MHz}$, $f_{OUT} = 6 \text{ MHz}/3 \text{ MHz}$ | -16.5 | -12.0 | -8.4 | 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 |
|--|---------------|--|------|------|------|---------|
| Luminance-system (continued) | | | | | | |
| DOC SW crosstalk | CT_{25-54} | $V_{IN} = 160 \text{ mV[p-p]}$, 1 MHz forced DOC | — | — | -40 | dB |
| YNR lim. (VNC) output level 4 | V_{25YL4} | $V_{IN} = 300 \text{ mV[p-p]}$, $f_{IN} = 1 \text{ MHz}$ | 15 | 30 | 45 | mV[p-p] |
| White noise compression level | V_{25WNS} | Trick mode, 3.8 MHz, 5.8 MHz | 2.2 | 2.9 | 3.3 | V[p-p] |
| Tune/line crosstalk | CT_{20-18} | $f = 1 \text{ MHz}$ | — | — | -40 | dB |
| Line/tuner crosstalk | CT_{18-20} | $f = 1 \text{ MHz}$ | — | — | -40 | dB |
| Chroma-system | | | | | | |
| M BPF [4.43 MHz] frequency characteristics rec. 1 | $f_{MR(1)-4}$ | 4.43 MHz mode, $f_{IN} = 2.3 \text{ MHz}/4.43 \text{ MHz}$ | — | — | -15 | dB |
| M BPF [4.43 MHz] frequency characteristics rec. 2 | $f_{MR(2)-4}$ | 4.43 MHz mode, $f_{IN} = 3.93 \text{ MHz}/4.43 \text{ MHz}$ | -3.5 | -2.0 | -0.5 | dB |
| M BPF [4.43 MHz] frequency characteristics rec. 3 | $f_{MR(3)-4}$ | 4.43 MHz mode, $f_{IN} = 4.93 \text{ MHz}/4.43 \text{ MHz}$ | -2.7 | -1.2 | 0.6 | dB |
| M BPF [4.43 MHz] frequency characteristics rec. 4 | $f_{MR(4)-4}$ | 4.43 MHz mode, $f_{IN} = 6.5 \text{ MHz}/4.43 \text{ MHz}$ | — | — | -10 | dB |
| M BPF [4.43 MHz] group delay rec. | GD_{MR-4} | 4.43 MHz mode, $f_{IN} = 4.43 \text{ MHz}$ | 340 | 390 | 440 | ns |
| M BPF [4.43 MHz] frequency characteristics PB 1 | $f_{MP(1)-4}$ | 4.43 MHz mode, $f_{IN} = 2.6 \text{ MHz}/4.43 \text{ MHz}$ | — | — | -15 | dB |
| M BPF [4.43 MHz] frequency characteristics PB 2 | $f_{MP(2)-4}$ | 4.43 MHz mode, $f_{IN} = 3.93 \text{ MHz}/4.43 \text{ MHz}$ | -5.5 | -3.7 | -2.0 | dB |
| M BPF [4.43 MHz] frequency characteristics PB 3 | $f_{MP(3)-4}$ | 4.43 MHz mode, $f_{IN} = 4.93 \text{ MHz}/4.43 \text{ MHz}$ | -6.4 | -3.9 | -1.4 | dB |
| M BPF [4.43 MHz] frequency characteristics PB 4 | $f_{MP(4)-4}$ | 4.43 MHz mode, $f_{IN} = 5.69 \text{ MHz}/4.43 \text{ MHz}$ | — | — | -30 | dB |
| M BPF [4.43 MHz] frequency characteristics PB 5 | $f_{MP(5)-4}$ | 4.43 MHz mode, $f_{IN} = 6.5 \text{ MHz}/4.43 \text{ MHz}$ | — | — | -15 | dB |
| M BPF [4.43 MHz] group delay PB | DG_{MP-4} | 4.43 MHz mode, $f_{IN} = 4.43 \text{ MHz}$ | 530 | 580 | 630 | ns |
| M BPF [3.58 MHz] frequency characteristics rec. 1 | $f_{MR(1)-4}$ | 3.58 MHz mode, $f_{IN} = 1.5 \text{ MHz}/3.58 \text{ MHz}$ | — | — | -15 | dB |
| M BPF [3.58 MHz] frequency characteristics rec. 2 | $f_{MR(2)-4}$ | 3.58 MHz mode, $f_{IN} = 3.08 \text{ MHz}/3.58 \text{ MHz}$ | -5.5 | -3.3 | -15 | dB |
| M BPF [3.58 MHz] frequency characteristics rec. 3 | $f_{MR(3)-4}$ | 3.58 MHz mode, $f_{IN} = 4.08 \text{ MHz}/3.58 \text{ MHz}$ | -3.5 | -1.0 | 1.0 | dB |
| M BPF [3.58 MHz] frequency characteristics rec. 4 | $f_{MR(4)-4}$ | 3.58 MHz mode, $f_{IN} = 6.5 \text{ MHz}/3.58 \text{ MHz}$ | — | — | -10 | dB |
| M BPF [3.58 MHz] group delay rec. | GD_{MR-4} | 3.58MHz mode, $f_{IN} = 3.58 \text{ MHz}$ | 390 | 470 | 550 | ns |

■ 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 |
|--|------------------|--|------|------|------|-------|
| Chroma-system (continued) | | | | | | |
| M BPF [3.58 MHz] frequency characteristics PB 1 | $f_{MP(1)-4}$ | 3.58 MHz mode, $f_{IN} = 1.5 \text{ MHz}/3.58 \text{ MHz}$ | — | — | -15 | dB |
| M BPF [3.58 MHz] frequency characteristics PB 2 | $f_{MP(2)-4}$ | 3.58 MHz mode, $f_{IN} = 3.08 \text{ MHz}/3.58 \text{ MHz}$ | -7.4 | -4.8 | -2.9 | dB |
| M BPF [3.58 MHz] frequency characteristics PB 3 | $f_{MP(3)-4}$ | 3.58 MHz mode, $f_{IN} = 4.08 \text{ MHz}/3.58 \text{ MHz}$ | -7.2 | -3.7 | -1.2 | dB |
| M BPF [3.58 MHz] frequency characteristics PB 4 | $f_{MP(4)-4}$ | 3.58 MHz mode, $f_{IN} = 4.84 \text{ MHz}/3.58 \text{ MHz}$ | — | — | -15 | dB |
| M BPF [3.58 MHz] frequency characteristics PB 5 | $f_{MP(5)-4}$ | 3.58 MHz mode, $f_{IN} = 6.5 \text{ MHz}/3.58 \text{ MHz}$ | — | — | -10 | dB |
| M BPF [3.58 MHz] group delay PB | GD_{MP-4} | 3.58 MHz mode, $f_{IN} = 3.58 \text{ MHz}$ | 580 | 660 | 740 | ns |
| CCD BPF frequency characteristics 1 | $f_{CDB(1)}$ | 4.43 MHz mode, $V_{IN} = 300 \text{ mV[p-p]}$, $f_{IN} = 3.93 \text{ MHz}/4.43 \text{ MHz}$ | -2.3 | -0.3 | 0.7 | dB |
| CCD BPF frequency characteristics 2 | $f_{CDB(2)}$ | 4.43 MHz mode, $V_{IN} = 300 \text{ mV[p-p]}$, $f_{IN} = 4.93 \text{ MHz}/4.43 \text{ MHz}$ | -2.2 | 0.1 | 0.8 | dB |
| CCD BPF frequency characteristics 3 | $f_{CDB(3)}$ | 4.43 MHz mode, $V_{IN} = 300 \text{ mV[p-p]}$, $f_{IN} = 8.86 \text{ MHz}/4.43 \text{ MHz}$ | — | -38 | -25 | dB |
| CCD BPF frequency characteristics 4 | $f_{CDB(4)}$ | 4.43 MHz mode, $V_{IN} = 300 \text{ mV[p-p]}$, $f_{IN} = 13.29 \text{ MHz}/4.43 \text{ MHz}$ | — | -40 | -30 | dB |
| CCD BPF frequency characteristics 5 | $f_{CDB(5)}$ | 3.58 MHz mode, $V_{IN} = 300 \text{ mV[p-p]}$, $f_{IN} = 3.08 \text{ MHz}/3.58 \text{ MHz}$ | -3.2 | -0.5 | 0.8 | dB |
| CCD BPF frequency characteristics 6 | $f_{CDB(6)}$ | 3.58 MHz mode, $V_{IN} = 300 \text{ mV[p-p]}$, $f_{IN} = 4.08 \text{ MHz}/3.58 \text{ MHz}$ | -2.8 | -0.2 | 1.2 | dB |
| CCD BPF frequency characteristics 7 | $f_{CDB(7)}$ | 3.58 MHz mode, $V_{IN} = 300 \text{ mV[p-p]}$, $f_{IN} = 7.16 \text{ MHz}/3.58 \text{ MHz}$ | — | -32 | -20 | dB |
| CCD BPF frequency characteristics 8 | $f_{CDB(8)}$ | 3.58 MHz mode, $V_{IN} = 300 \text{ mV[p-p]}$, $f_{IN} = 14.32 \text{ MHz}/3.58 \text{ MHz}$ | — | -48 | -30 | dB |
| Phase shifter +45° gain | G_{HPF} | $V_{IN} = 300 \text{ mV[p-p]}$, $f_{IN} = 4.43 \text{ MHz}$ | -7.0 | -6.0 | -5.0 | dB |
| Phase shifter -45° gain | G_{LPF} | $V_{IN} = 300 \text{ mV[p-p]}$, $f_{IN} = 4.43 \text{ MHz}$ | -7.0 | -6.0 | -5.0 | dB |
| Phase shifter +45° phase | P_{HPF} | $V_{IN} = 300 \text{ mV[p-p]}$, $f_{IN} = 4.43 \text{ MHz}$ | 40 | 45 | 50 | deg |
| Phase shifter -45° phase | P_{LPF} | $V_{IN} = 300 \text{ mV[p-p]}$, $f_{IN} = 4.43 \text{ MHz}$ | -50 | -45 | -40 | deg |
| VXO control sensitivity 1 | $\beta_{VXO(1)}$ | $V_{84} = 2.2 \text{ V}/2.6 \text{ V}$, $(1/2 \times \Delta f_{78}) / 400 \text{ mV}$ | 1.0 | 2.2 | 4.0 | Hz/mV |
| VXO control sensitivity 2 | $\beta_{VXO(2)}$ | $V_{84} = 2.2 \text{ V}/2.6 \text{ V}$, $(1/2 \times \Delta f_{78}) / 400 \text{ mV}$ | 0.7 | 1.7 | 3.1 | Hz/mV |

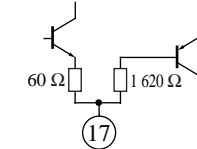
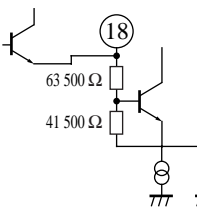

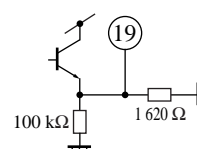
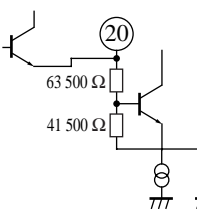

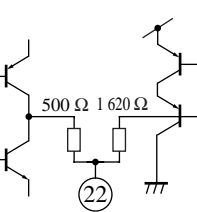
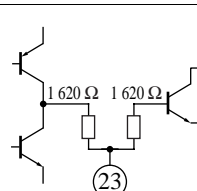
■ Terminal Equivalent Circuits

| Pin No. | Equivalent circuit | Impedance (Z) | Description | Waveform | | Voltage DC (V) |
|---------|--------------------|---------------|-----------------------------------|---------------------|---|----------------|
| | | | | EE mode | VV mode | |
| 1 | | 30 kΩ | Y/C mix. PB chroma input pin | — | | 4.5 |
| 2 | | 50 kΩ | EE/VV/trick changeover pin | EE: 3.5 V to 5 V | VV: 1.75 V to 3.0 V Trick: 0 V to 1.25 V | — |
| 3 | | EF | PB chroma output pin | — | | 2.0 |
| 4 | — | — | V _{CC} pin (chroma main) | DC | | 5.0 |
| 5 | — | — | V _{CC} pin (chroma APC) | DC | | 5.0 |
| 6 | | 10 kΩ | BM balance capacitor pin | DC | | 2.7 |
| 7 | | High | ACC detection pin | DC | | 2.15 |
| 8 | | OC | Field AGC detection pin | | | 0.2 (on) |
| 9 | | OC | Field AGC detection pin | | | 0.2 (on) |

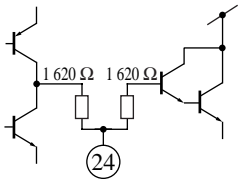
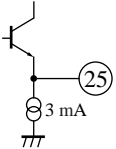

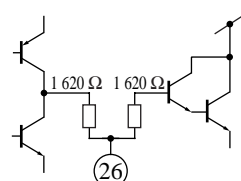
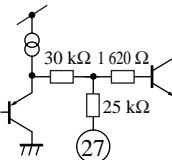

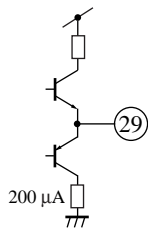

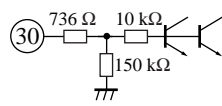
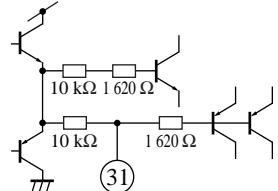
■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Impe- dance (Z) | Description | Waveform | | Voltage DC (V) |
|---------|--------------------|---------------------|-----------------------------------|------------------------------|---------|-------------------|
| | | | | EE mode | VV mode | |
| 10 | | 50 kΩ | Comb-side chroma input pin | — | | 2.7 |
| 11 | | High | Color killer detection pin | Killer on at 2.13 V or below | | 2.4 |
| 12 | | EF | Comb filter driving output pin | — | | 2.0 |
| 13 | | EF | SECAM detection 1-pin | DC | | — |
| 14 | | EF | SECAM detection 2-pin | DC | | — |
| 15 | | 500 Ω + VT/IE | Sync. separation det. pin | DC | | 1.4 |
| 16 | | Rc | Sync. separation pulse output pin | | | — |

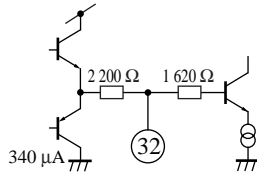
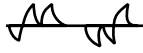
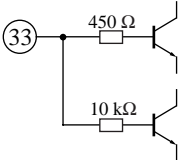
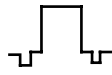
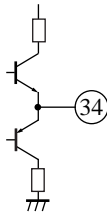
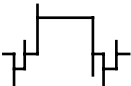
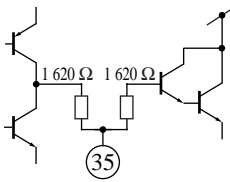

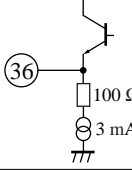
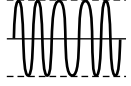
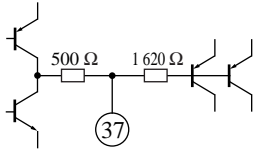
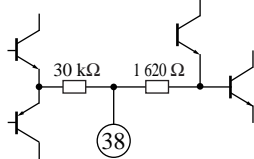
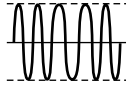
■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Impe- dance (Z) | Description | Waveform | | Voltage DC (V) |
|---------|---|--------------------|--------------------------------|---|---------|-------------------|
| | | | | EE mode | VV mode | |
| 17 |  | 60 Ω + VT/IE | AGC detection pin | DC | — | 2.25 |
| 18 |  | 105 kΩ | Line input pin |  | — | 3.0 |
| 19 |  | EF | V _{REG} | DC | ← | 2.0 |
| 20 |  | 105 kΩ | Tuner input pin |  | — | 3.0 |
| 21 | — | — | V _{CC} pin (Y-system) | DC | ← | 5.0 |
| 22 |  | High | CCD AGC detection pin | DC | ← | Typ. 2.4 |
| 23 |  | High | Clamp 1 detection pin | DC | ← | 2.3 |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Impe- dance (Z) | Description | Waveform | | Voltage DC (V) |
|---------|---|--------------------|------------------------------|---|--|-------------------|
| | | | | EE mode | VV mode | |
| 24 |  | High | Clamp 2 detection pin | DC | ← | 2.3 |
| 25 |  | EF | Video signal output pin |  | ← | Sync. 1.0 |
| 26 |  | High | Clamp 4 detection pin | DC | ← | 2.3 |
| 27 |  | 55 kΩ | CCD output pin |  | ← | 2.0 |
| 28 | — | — | GND (Y-system) | — | — | 0 |
| 29 |  | EF | CCD input pin |  | ← | Sync. 1.7 |
| 30 |  | 150 kΩ | Quasi sync. pulse input pin | — | Single level: 3.5 V to 5 V Gray level: 1.5 V to 3 V Through: 0 V to 1 V | — |
| 31 |  | 10 kΩ | Correlation detection DC pin | DC | ← | — |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Impe- dance (Z) | Description | Waveform | | Voltage DC (V) |
|---------|---|--------------------|---|--|---|-------------------|
| | | | | EE mode | VV mode | |
| 32 |  | 2.2 kΩ | N.C. LPF pin | — |  | 2.4 |
| 33 |  | OB | Main emphasis feedback input pin/ VV edit changeover pin |  | VV edit: 4 V to 5 V | Sync. 1.7 |
| 34 |  | EF | Main emphasis output pin |  | — | Sync. 1.7 |
| 35 |  | High | Clamp 3 detection pin | DC |  | 2.3 |
| 36 |  | EF | MOD output pin |  | — | 2.5 |
| 37 |  | High | f ₀ detection pin | DC | — | 2.2 |
| 38 |  | 30 kΩ | Rec. FM input pin |  | — | 2.7 |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Impedance (Z) | Description | Waveform | | Voltage DC (V) |
|---------|--------------------|------------------|---|---|-------------------------|----------------|
| | | | | EE mode | VV mode | |
| 39 | | High | Line/test1/tuner changeover pin | Line: 3.5 V to 5 V Test1: 1.75 V to 3 V Tuner: 0 V to 1.25 V | Test1: 1.75 V to 3 V | — |
| 40 | | Rc | SECAM ID output pin | DC High at SECAM | | — |
| 41 | | EF/ 30 kΩ | Rec. YC output pin/ PB envelope input pin | | | 2.7 |
| 42 | — | — | GND pin Y (PF-system) | DC | DC | 0 |
| 43 | | 540 Ω + EF | RF AGC detection pin/ EE edit changeover pin | EE edit: 4 V to 5 V | | 2.5 |
| 44 | | EF | Phase shift (positive) | DC | 2.5 | |
| 45 | | EF | Phase shift (negative) | DC | 2.5 | |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Impedance (Z) | Description | Waveform | | Voltage DC (V) |
|---------|--------------------|----------------|---|--|--|----------------|
| | | | | EE mode | VV mode | |
| 46 | | OB | Phase shift in | DC | | 2.5 |
| 47 | — | — | V _{CC} pin Y (MOD output block RF system) | DC | DC | 5.0 |
| 48 | | R _E | RF peaking/SQPB changeover pin | DC | SQPB: 3.25 V to 5 V | 1.0 |
| 49 | | OB | Rotary pulse input pin | | | — |
| 50 | | 50 kΩ | MESECAM/PAL/NTSC changeover pin | MESECAM: 3.5 V to 5 V PAL: 1.75 V to 3 V NTSC: 0 V to 1.25 V | | — |
| 51 | | 30 kΩ | Y ext. PF FM input pin | — | Pin 51: open Pin 51: 0 V to 1 V Internal RFEQ | 3.0 |
| 52 | | High | PB NTSC changeover pin | PB NTSC: 3.5 V to 5 V Test2: 1.75 V to 3 V Through: 0 V to 1.25 V | | — |
| 53 | | VT/ IE | Main de-emphasis peaking pin | — | | 1.5 |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Impe- dance (Z) | Description | Waveform | | Voltage DC (V) |
|---------|--------------------|--------------------|----------------------------------|---|---------|-------------------|
| | | | | EE mode | VV mode | |
| 54 | | OC | Main de-emphasis output pin | — | | 3.5 |
| 55 | | High | 4.43 MHz/3.58 MHz changeover pin | 4.43: 1.75 V to 5 V 3.58: 0 V to 1.25 V | | — |
| 56 | | High | EP/LP/SP changeover pin | EP: 3.5 V to 5 V LP: 1.75 V to 3 V SP: 0 V to 1.25 V | | — |
| 57 | | 32 kΩ | NA-PB amp. in | — | | 2.5 |
| 58 | | EF | NA-PB out | — | | 3.2 |
| 59 | | SP SLP 8 kΩ | NA-PB EQ. SW | — | | 2.5 |
| 60 | | O.B. | NA-PB NF | — | | 2.5 |

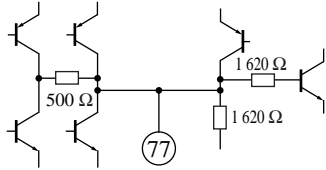
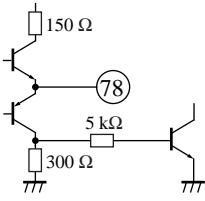
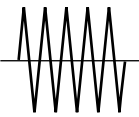
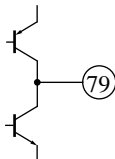
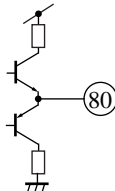
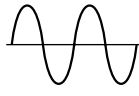
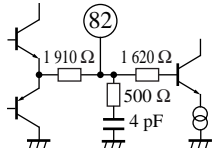
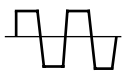
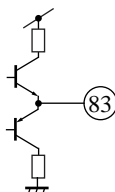
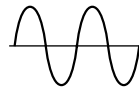
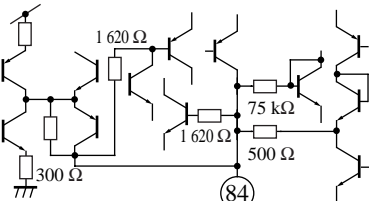
■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Impedance (Z) | Description | Waveform | | Voltage DC (V) |
|---------|--------------------|------------------------------------|---------------------------|----------|---|----------------|
| | | | | EE mode | VV mode | |
| 61 | | EE P.P. VV 80 kΩ | NA-PB in | DC | -68.3 dBV | 2.5 |
| 62 | | SP/LP 100 kΩ SLP | NA-PB SLP SW | DC | | 0 |
| 63 | — | — | GND | — | — | 0 |
| 64 | | EE P.P. VV 100 kΩ | NA-rec. out | | | 2.5 |
| 65 | | 1 kΩ | NA-rec. EQ. NF | | | 2.5 |
| 66 | | SP 100 kΩ LP/ SLP P.P. | NA-rec. EQ. LP/ SLP SW | DC | | 2.5 |
| 67 | — | — | V _{CC} | DC | | 5.0 |
| 68 | | P.P. | NA-line out | | (Typ.) -5.7 dBV = 1.47 V[p-p] | 2.5 |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Impedance (Z) | Description | Waveform | | Voltage DC (V) |
|---------|--------------------|---------------|---|--|---------|----------------|
| | | | | EE mode | VV mode | |
| 69 | | 210 kΩ | NA-mute in | DC Mute: 3.5 V to 5 V Through: 0 V to 1.25 V | ← | — |
| 70 | | 30 kΩ | NA-tuner in | (Typ.) -29 dBV = 100 mV[p-p] | — | 2.5 |
| 71 | | 25 kΩ | NA V _{REF} | DC | ← | 2.5 |
| 72 | | — | NA-AGC det. | DC | ← | — |
| 73 | | 30 kΩ | NA-line in | (Typ.) -29 dBV = 100 mV[p-p] | — | 2.5 |
| 74 | | Low | f _{VCO} adjustment pin | DC | DC | 0.6 |
| 75 | — | — | GND (for VCO) | — | — | 0 |
| 76 | | 20 kΩ | ACC output pin Y LPF output pin Killer output pin | Low at killer | ← | 2.7 |

■ Terminal Equivalent Circuits (continued)

| Pin No. | Equivalent circuit | Impe- dance (Z) | Description | Waveform | | Voltage DC (V) |
|---------|---|--------------------------------|---|--|---------|-------------------|
| | | | | EE mode | VV mode | |
| 77 |  | Rc | Rec. AFC, PB APC detection pin | DC | DC | 2.1 |
| 78 |  | EF | 2f _{SC} output pin |  | ← | 2.7 |
| 79 |  | High | Side lock detection pin | Side lock detec- tion current | ← | — |
| 80 |  | EF | Xtal output pin 3.58 MHz |  | ← | 3.6 |
| 81 | — | — | GND (chroma-system) | — | — | 0 |
| 82 |  | 1 910 Ω | Xtal input pin |  | ← | 2.7 |
| 83 |  | EF | Xtal output pin 4.43 MHz |  | ← | 3.6 |
| 84 |  | EE 75 kΩ VV 75 kΩ | Rec. APC, f _H AFC detection pin | DC | ← | 2.4 |

