

AN3986FBP, AN3986FHP

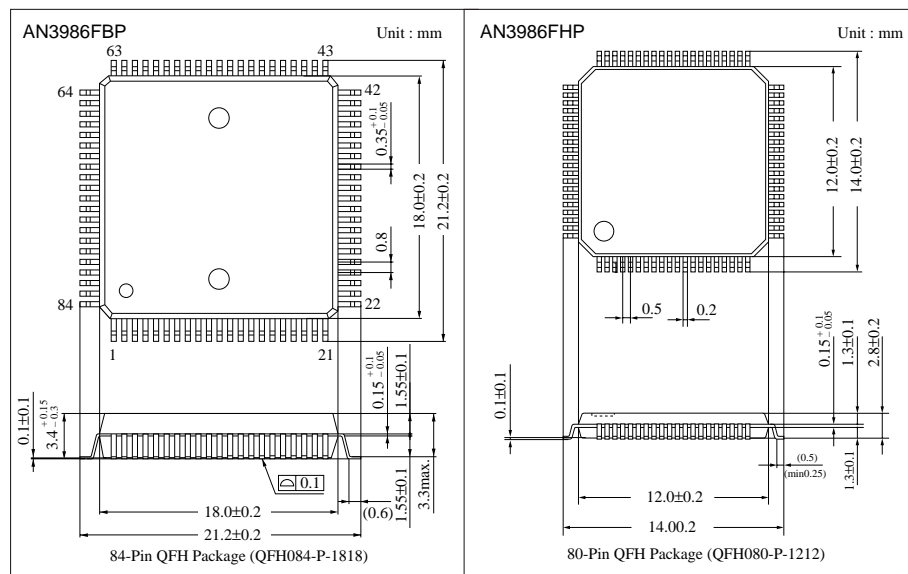
Stereo Audio Signal Processor ICs for 8-mm Camcorder

■ Overview

The AN3986FBP and the AN3986FHP are stereo audio signal processor ICs for 8-mm camcorder. It incorporates all the functions needed for stereo-audio signal processing in 8mm camcorder.

■ Features

- Built-in headphone amplifiers
- Built-in matrix signal processing



■ Absolute Maximum Ratings

AN3986FBP

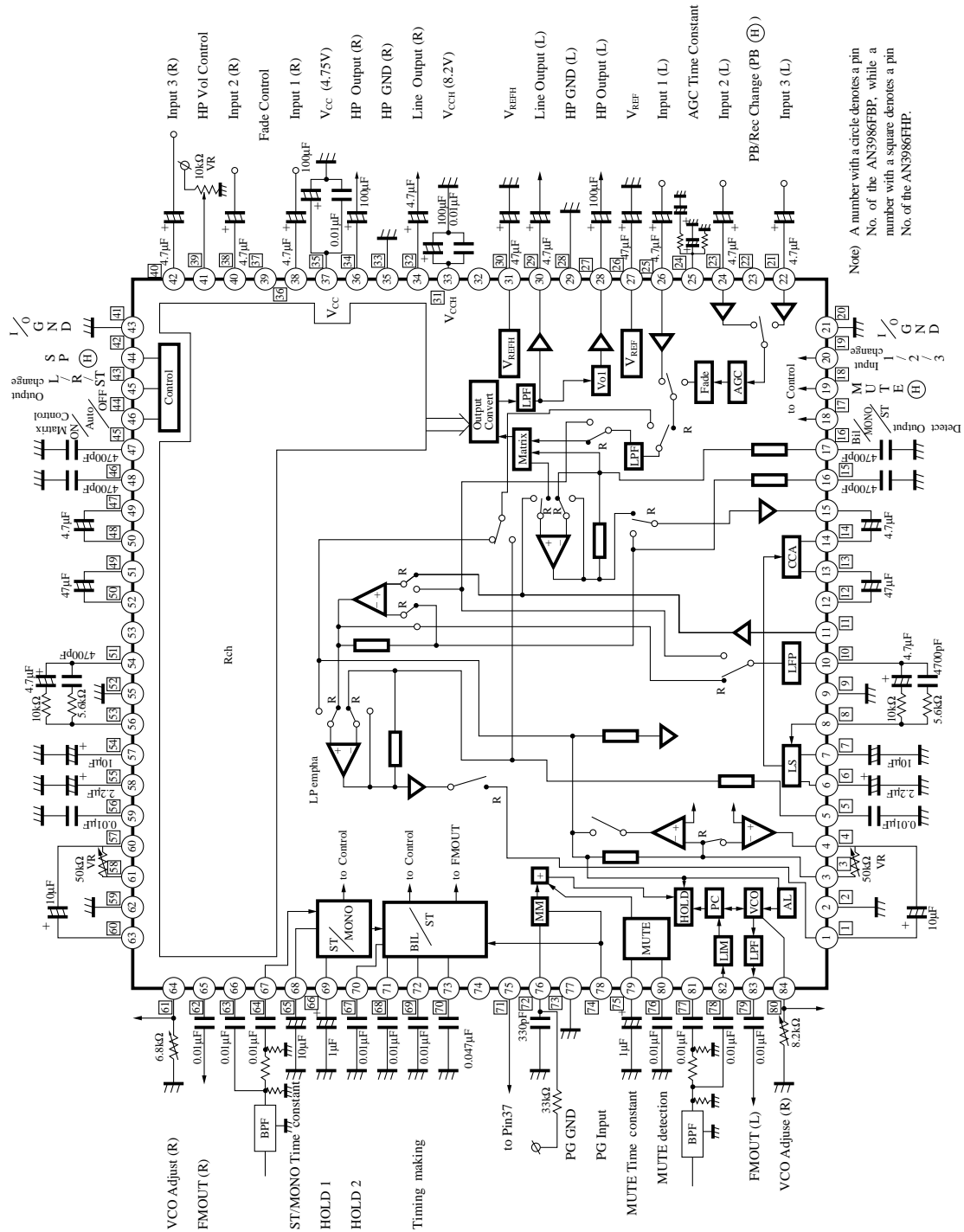
| Parameter | Symbol | Rating | Unit |
|--------------------------------------------------|-----------|---------------------------|------|
| Supply voltage | V_{CC} | $V_{CC1}=6 / V_{CC2}=9.5$ | V |
| Power dissipation ^{Note 2)} | P_D | 474 | mW |
| Operating ambient temperature ^{Note 1)} | T_{opr} | -20 to +70 | °C |
| Storage temperature ^{Note 1)} | T_{stg} | -55 to +125 | °C |

AN3986FHP

| Parameter | Symbol | Rating | Unit |
|--------------------------------------------------|-----------|---------------------------|------|
| Supply voltage | V_{CC} | $V_{CC1}=6 / V_{CC2}=9.5$ | V |
| Power dissipation ^{Note 2)} | P_D | 392 | mW |
| Operating ambient temperature ^{Note 1)} | T_{opr} | -20 to +70 | °C |
| Storage temperature ^{Note 1)} | T_{stg} | -55 to +125 | °C |

Note 1) $T_a=25^{\circ}\text{C}$ except operating ambient temperature and storage temperature unless otherwise specified.
 Note 2) Allowable power dissipation of the package at $T_a=70^{\circ}\text{C}$.

■ Block Diagram



■ Recommended Operating Range (Ta=25°C)

| Parameter | Symbol | Range |
|--------------------------------|------------------|--------------|
| Operating supply voltage range | V _{CC1} | 4.5V to 5.5V |
| | V _{CC2} | 4.5V to 9.0V |

■ Pin Descriptions

| Pin No. | | Pin name | Pin No. | | Pin name |
|-----------|-----------|----------------------------|-----------|-----------|------------------------------|
| AN3986FHP | AN3986FBP | | AN3986FHP | AN3986FBP | |
| 1 | 1 | NR input/output (L) | 41 | 43 | GND |
| 2 | 2 | GND | 42 | 44 | SP/EP mode switching |
| 3 | 3 | Dev. adjustment 1 (L) | 43 | 45 | Output switching control |
| 4 | 4 | Dev. adjustment 2 (L) | 44 | 46 | Matrix control |
| 5 | 5 | LP emphasis (L) | 45 | 47 | NR emphasis (R) |
| 6 | 6 | Level sensor timing C1 (L) | 46 | 48 | FM emphasis (R) |
| 7 | 7 | Level sensor timing C2 (L) | 47 | 49 | Buffer input (R) |
| 8 | 8 | Level sensor input (L) | 48 | 50 | CCA input (R) |
| 9 | 9 | GND | 49 | 51 | CCA output (R) |
| 10 | 10 | LPF output (L) | 50 | 52 | CCA amp. input (R) |
| 11 | 12 | CCA amp. input (L) | 51 | 54 | LPF output (R) |
| 12 | 13 | CCA output (L) | 52 | 55 | GND |
| 13 | 14 | CCA input (L) | 53 | 56 | Level sensor input (R) |
| 14 | 15 | Buffer output (L) | 54 | 57 | Level sensor timing C2 (R) |
| 15 | 16 | FM emphasis (L) | 55 | 58 | Level sensor timing C1 (R) |
| 16 | 17 | NR emphasis (L) | 56 | 59 | LP emphasis (R) |
| 17 | 18 | Mode discriminator output | 57 | 60 | Dev. adjustment 2 (R) |
| 18 | 19 | Mute control | 58 | 61 | Dev. adjustment 1 (R) |
| 19 | 20 | Input change switch | 59 | 62 | GND |
| 20 | 21 | GND | 60 | 63 | NR input/output (R) |
| 21 | 22 | Input 3 (L) | 61 | 64 | VCO frequency adjustment (R) |
| 22 | 23 | Rec/PB switching (L) | 62 | 65 | FM modulator output (R) |
| 23 | 24 | Input 2 (L) | 63 | 66 | FM demodulator input (R) |
| 24 | 25 | AGC time-constant | 64 | 67 | FM detector input (R) |
| 25 | 26 | Input 1 (L) | 65 | 68 | FM input AGC detection |
| 26 | 27 | V _{REF} | 66 | 69 | ST/MON time-constant |
| 27 | 28 | Headphone output (L) | 67 | 70 | HOLD 2 |
| 28 | 29 | Headphone GND (L) | 68 | 71 | HOLD 1 |
| 29 | 30 | Line output (L) | 69 | 72 | ST/MON detection |
| 30 | 31 | V _{REF} H | 70 | 73 | Bilingual timing generation |
| 31 | 33 | V _{CC2} | 71 | 75 | V _{CC1} (FM) |
| 32 | 34 | Line output (R) | 72 | 76 | Mono/multi time-constant |
| 33 | 35 | Headphone GND (R) | 73 | 77 | GND (PG) |
| 34 | 36 | Headphone output (R) | 74 | 78 | PG input |
| 35 | 37 | V _{CC1} | 75 | 79 | MUTE time-constant |
| 36 | 38 | Input 1 (R) | 76 | 80 | MUTE detection |
| 37 | 39 | Fade control | 77 | 81 | FM detection input (L) |
| 38 | 40 | Input 2 (R) | 78 | 82 | FM demodulator input (L) |
| 39 | 41 | Headphone volume control | 79 | 83 | FM modulator output (L) |
| 40 | 42 | Input 3 (R) | 80 | 84 | VCO frequency adjustment (L) |

Note) Pins 11, 32, 53, and 74 of the AN3986FBP are to be left open.

■ Electrical Characteristics (cont.) ($V_{CC1}=4.75V$, $V_{CC2}=8.2V$, $T_a=25\pm 2^\circ C$) (AN3986FHP)

| Parameter | Symbol | Condition | min | typ | max | Unit |
|-------------------------------------------------------|----------------------------|--------------------------------------------|------|------|-------|------|
| Circuit current 1 at recording | I_{R35} | $V_{CC1}=4.75V$, when no signal input | 58 | 73 | 88 | mA |
| Circuit current 2 at recording | I_{R31} | $V_{CC2}=8.20V$, when no signal input | 1.6 | 2.0 | 2.4 | mA |
| Circuit current 1 at playing back | I_{P35} | $V_{CC1}=4.75V$, when no signal input | 61 | 77 | 93 | mA |
| Circuit current 1 at playing back | I_{R31} | $V_{CC2}=8.20V$, when no signal input | 1.6 | 2.0 | 2.4 | mA |
| Line AGC output level Lch, Rch | V_{OALL} V_{OALR} | $V_{IN}=20dBs$ $f=400Hz$ | -8 | -7 | -6 | dBs |
| Line AGC output distortion factor Lch, Rch | T_{HALL1} T_{HALR1} | $V_{IN}=20dBs$ $f=1kHz$, THD 5th | — | 0.02 | 0.1 | % |
| AGC ON output level Lch, Rch | V_{OALL2} V_{OALR2} | $V_{IN}=-2dBs$ $f=400Hz$ | -4 | -1 | +2 | dBs |
| AGC ON output distortion factor Lch, Rch | T_{HALL2} T_{HALR2} | $V_{IN}=-2dBs$ $f=1kHz$, THD 5th | — | 0.2 | 0.4 | % |
| Line AGC output noise Lch, Rch | V_{NALL} V_{NALR} | No input A curve filter | — | -78 | -74 | dBs |
| Fade control maximum attenuation output Lch, Rch | V_{FALL} V_{FALR} | $V_{IN}=-20dBs$, 1kHz A curve filter | — | -80 | -75 | dBs |
| Line through monitor output level Lch, Rch | V_{OILL} V_{OILR} | $V_{IN}=-20dBs$, 400Hz | -8 | -7 | -6 | dBs |
| Line through monitor output noise Lch, Rch | V_{NLLL} V_{NLLR} | No input A curve filter | — | -81 | -77 | dBs |
| Between inputs between channels crosstalk | V_{CTIN} | $V_{IN}=-14dBs$, 1kHz A curve filter | — | -78 | -74 | dB |
| E-E monitor output frequency characteristics Lch, Rch | V_{OLFL} V_{OLFR} | $V_{IN}=-20dBs$ ratio of 40kHz/40Hz | — | -5.5 | -2.5 | dBs |
| HP output level $V_{OL}=CENTER$ Lch, Rch | V_{HC8L} V_{HC8R} | $V_{IN}=-20dBs$, 400Hz 8Ω load | -28 | -26 | -24 | dBs |
| HP output distortion factor $V_{OL}=CENTER$ Lch, Rch | T_{HHC8L} T_{HHC8R} | $V_{IN}=-20dBs$, 1kHz 8Ω load, THD 5th | — | 0.05 | 0.5 | % |
| HP output level $V_{OL}=MAX$ Lch, Rch | V_{HH8L} V_{HH8R} | $V_{IN}=-20dBs$, 400Hz 8Ω load | -18 | -16 | -14 | dBs |
| HP output level $V_{OL}=MIN$ Lch, Rch | V_{HL8L} V_{HL8R} | $V_{IN}=-20dBs$, 400Hz 8Ω load | — | -96 | -92 | dBs |
| HP output noise voltage $V_{OL}=MIN$ Lch, Rch | V_{NHCOL} V_{NHCOR} | No input A curve filter | — | -96 | -92 | dBs |
| HP maximum output level $V_{OL}=CENTER$ Lch, Rch | V_{MH8L} V_{MH8R} | 1kHz, at 1% distortion, 8Ω load THD 5th | -18 | — | — | dBs |
| Encode output level Lch, Rch | V_{ORLL} V_{ORLR} | $V_{IN}=-20dBs$, 400Hz BIL mode | -18 | -15 | -12 | dBs |
| Encode output distortion factor Lch, Rch | T_{HORLL} T_{HORLR} | $V_{IN}=-20dBs$, 1kHz to THD 5th | — | 0.2 | 0.4 | % |
| Encode linearity Lch, Rch | V_{OXLL} V_{OXLR} | $V_{IN}=-11.2/-51.2BS$ $f=400Hz$ | -21 | -20 | -19 | dB |
| SP encode f characteristics Lch, Rch | V_{FORLL} V_{FORLR} | $V_{IN}=-20dBs$ $f=10kHz/400Hz$ | 3.8 | 4.8 | 5.8 | dB |
| LP encode f characteristics Lch, Rch | V_{FLRLL} V_{FLRLR} | $V_{IN}=-20dBs$, 10kHz ratio of LP/SP | 2.0 | 3.0 | 4.0 | dB |
| Encode output noise Lch, Rch | V_{NRLL} V_{NRRR} | No input A curve filter | — | -55 | -51 | dB |
| ST/BIL level difference L + R Lch | V_{BSRLL} | $V_{IN}=-20dBs$, 400Hz | -0.5 | 0 | +0.5 | dB |
| ST/BIL level difference L - R Lch | V_{BSRLR} | $V_{IN}=-20dBs$, 400Hz 30kHz LPF | — | -30 | -17.5 | dB |
| MON/BIL level difference Lch | V_{BMRLL} | $V_{IN}=-20dBs$, 400Hz | -0.5 | 0 | +0.5 | dB |
| Decode reference output level Lch, Rch | V_{OLPL} V_{OLPR} | V_{OLL} , input V_{ORLR} | -9.5 | -7 | -4.5 | dB |

■ Electrical Characteristics (cont.) ($V_{CC1}=4.75V$, $V_{CC2}=8.2V$, $T_a=25\pm 2^\circ C$) (AN3986FHP)

| Parameter | Symbol | Condition | min | typ | max | Unit |
|----------------------------------------------------|----------------------------|----------------------------------------------------------|-------|------|-------|-------------------|
| Decode reference output distortion factor Lch, Rch | T_{HOLPL} T_{HOLPR} | V_{ORLL} , input V_{ORLR} | — | 0.12 | 0.3 | % |
| Decode linearity Lch, Rch | V_{OXPL} V_{OXPR} | $V_{IN}=-11.6/-41.6dBs$ $f=400Hz$ | -63 | -60 | -57 | dB |
| Decode output noise Lch, Rch | V_{NLPL} V_{NLPR} | No input A curve filter | — | -87 | -79 | dBs |
| Crosstalk Lch, Rch, at playback | C_{ERL} C_{ERR} | $V_{IN}=-20dBs$, 1kHz A curve filter | — | — | -79 | dBs |
| Maximum output level Lch, Rch, at playback | V_{OLML} V_{OLMR} | $V_{IN}=-10dBs$, 1kHz THD 5th | — | 0.4 | 1.0 | % |
| Line mute attenuation quantity Lch, Rch | V_{MLML} V_{MLMR} | $V_{IN}=-20dBs$, 1kHz A curve filter | — | -92 | -87 | dBs |
| Encode channel crosstalk Lch, Rch | S_{ERL} S_{ERR} | $V_{IN}=-14dBs$, 1kHz A curve filter | — | -50 | -47 | dBs |
| E-E system monitor output channel balance | B_{AL} | V_{OALR}/V_{OALL} | -0.55 | 0 | +0.55 | dB |
| Encode output channel balance | B_{RE} | V_{ORLR}/V_{ORLL} | -2 | 0 | +2 | dB |
| Decode output channel balance | B_{LP} | V_{OLPR}/V_{OLPL} | -3 | 0 | +3 | dB |
| VCO free-run frequency Lch | F_{OL} | $R=8.2k\Omega$ | 1.35 | 1.50 | 1.65 | MHz |
| VCO free-run frequency Rch | F_{OR} | $R=6.8k\Omega$ | 1.55 | 1.70 | 1.85 | kHz |
| VCO output amplitude voltage Lch | V_{79} | when $f=1.5MHz$ | 456 | 500 | 548 | mV _{P-P} |
| VCO output amplitude voltage Rch | V_{62} | when $f=1.7MHz$ | 410 | 450 | 493 | mV _{P-P} |
| VCO 2nd harmonics output Lch | V_{79-2} | fundamental wave as 0dB | — | -50 | -35 | dB |
| VCO 2nd harmonics output Rch | V_{62-2} | fundamental wave as 0dB | — | -50 | -35 | dB |
| VCO reference frequency deviation Lch | V_{79-3} | fundamental wave as 0dB | — | -50 | -40 | dB |
| VCO reference frequency deviation Rch | V_{62-3} | fundamental wave as 0dB | — | -50 | -40 | dB |
| VCO reference frequency deviation Lch | F_{DOL} | $\Delta V=\pm 195.2mV$ (-15dBs equivalent) | 90 | 120 | 150 | kHz |
| VCO reference frequency deviation Rch | F_{DOR} | $\Delta V=\pm 195.2mV$ (-15dBs equivalent) | 45 | 60 | 75 | kHz |
| Maximum frequency deviation 1 Lch | F_{DLMX1} | input $\Delta V=-617mV$ (-5dBs equivalent) | 96 | 110 | 128 | kHz |
| Maximum frequency deviation 2 Lch | F_{DLMX2} | input $\Delta V=+617mV$ (-5dBs equivalent) | -128 | -110 | -96 | kHz |
| Maximum frequency deviation 1 Rch | F_{DRMX1} | input $\Delta V=-617mV$ (-5dBs equivalent) | 48 | 55 | 64 | kHz |
| Maximum frequency deviation 2 Rch | F_{DRMX2} | input $\Delta V=+617mV$ (-5dBs equivalent) | -64 | -55 | -48 | kHz |
| Boost start time Lch, Rch, at recording | T_{BSL} T_{BSR} | time from PG input | — | — | 200 | μs |
| Boost level Lch, Rch | V_{BSL} V_{BSR} | level difference due to gain-up | 6 | — | 9 | dB |
| Boost width Lch, Rch | T_{BEL} T_{BER} | time of gain-up | 1.1 | 1.3 | 1.5 | ms |
| Reference FM modulation distortion factor Lch, Rch | T_{HDL} T_{HDR} | $V_{IN}=-15dBs$, $f=1kHz$ THD 5th after demodulation | — | — | 0.3 | % |
| FM demodulation output Lch | V_{DEL1} | $DEV=\pm 60kHz$ $f_m=400Hz$ | -18 | -15 | -12 | dBs |
| FM demodulation output Rch | V_{DER1} | $DEV=\pm 30kHz$ $f_m=400Hz$ | -18 | -15 | -12 | dBs |
| FM demodulation output distortion ratio Lch | T_{HDEL1} | $DEV=\pm 60kHz$ $f_m=1kHz$ | — | — | 0.3 | % |
| FM demodulation output distortion ratio Rch | T_{HDER1} | $DEV=\pm 30kHz$ $f_m=1kHz$ | — | — | 0.3 | % |
| Dropout detection ON level | DODON | $V_{IN}=30mV_{P-P}$ as 0dB $f=1.5MHz$ | -11 | -14 | -18 | dB |

■ Electrical Characteristics (cont.) ($V_{CC1}=4.75V$, $V_{CC2}=8.2V$, $T_a=25\pm 2^\circ C$) (AN3986FHP)

| Parameter | Symbol | Condition | min | typ | max | Unit |
|-----------------------------------------------------|------------|--------------------------------------------------|------|------|------|---------|
| Dropout off hysteresis width | DODOFF | $V_{in}=30mV_{P-P}$ as 0dB | 2 | 4 | 6 | dB |
| MUTE change-over ON level | MUTON | $V_{in}=30mV_{P-P}$ as 0dB $f=1.5MHz$ | -9 | -12 | -16 | dB |
| MUTE OFF hysteresis | MUTOFF | $V_{in}=30mV_{P-P}$ as 0dB | 1 | 3 | 5 | dB |
| AUTO MONO detection level | V_{ATMS} | $V_{in}=30mV_{P-P}$ as 0dB $f=1.7MHz$ | -9 | -12 | -16 | dB |
| AUTO MONO OFF hysteresis | V_{ATME} | $V_{in}=30mV_{P-P}$ as 0dB | 0.5 | 2.0 | 4 | dB |
| Hold start time Lch | T_{HOSL} | time from PG input to hold start | 1.0 | 1.5 | 2.0 | μs |
| Hold start time Rch | T_{HOSR} | | 1.0 | 1.5 | 2.0 | μs |
| Hold end time Lch | T_{HOFL} | time from PG input to hold end | 8.5 | 10.0 | 11.5 | μs |
| Hold end time Rch | T_{HOFR} | | 12.2 | 14.0 | 15.8 | μs |
| Bilingual discrimination level | V_{BIS1} | Boost level | 3 | — | — | dB |
| Bilingual discrimination level hysteresis | V_{BIE1} | | 0.5 | 2 | 4 | dB |
| Self recording playback level Lch | V_{RPL} | $V_{in}=-20dBs$, $f=400Hz$ bilingual MODE | -9.5 | -7.0 | -4.5 | dBs |
| Self recording playback level Rch | V_{RPR} | | -8.5 | -6.0 | -3.5 | dBs |
| Self recording playback level (R/L) channel balance | B_{RPL} | $V_{in}=-20dBs$, $f=400Hz$ V_{RPR}/V_{RPL} | 0 | 1.0 | 2.0 | dB |
| Rec. holding voltage | V_{22R} | | 0 | — | 1.4 | V |
| PB holding voltage | V_{22P} | | 3.4 | — | 4.75 | V |
| Line mute ON voltage | V_{18MN} | | 3.4 | — | 4.75 | V |
| Line mute OFF voltage | V_{18MF} | | 0 | — | 1.4 | V |
| Input change-over selection voltage LINE 1 | V_{191} | | 3.9 | — | 4.75 | V |
| Input change-over selection voltage LINE 2 | V_{192} | | 2.1 | — | 2.7 | V |
| Input change-over selection voltage LINE 3 | V_{193} | | 0 | — | 0.8 | V |
| SP mode holding voltage | V_{42S} | | 3.4 | — | 4.75 | V |
| LP mode holding voltage | V_{42L} | | 0 | — | 1.4 | V |
| Output change-over selection voltage Lch | V_{43H} | | 3.9 | — | 4.75 | V |
| Output change-over selection voltage Rch | V_{43M} | | 2.1 | — | 2.7 | V |
| Output change-over selection voltage STE | V_{43L} | | 0 | — | 0.8 | V |
| Matrix control holding voltage ON | V_{44H} | | 3.9 | — | 4.75 | V |
| Matrix control holding voltage AUTO | V_{44M} | | 2.1 | — | 2.7 | V |
| Matrix control holding voltage OFF | V_{44L} | | 0 | — | 0.8 | V |
| PG input voltage high level | V_{74H} | | 3.4 | — | 4.75 | V |
| PG input voltage low level | V_{74L} | | 0 | — | 1.4 | V |
| Discrimination output voltage BIL | V_{17H} | | 3.4 | — | 4.75 | V |
| Discrimination output voltage MON | V_{17M} | | 1.5 | — | 2.6 | V |
| Discrimination output voltage STE | V_{17L} | | 0 | — | 0.8 | V |

■ Electrical Characteristics ($V_{CC1}=4.75V$, $V_{CC2}=8.2V$, $T_a=25\pm 2^\circ C$) (AN3986FBP)

| Parameter | Symbol | Condition | min | typ | max | Unit |
|--------------------------------------------------------|----------------------------|----------------------------------------------|------|------|-------|------|
| Circuit current 1 | I_{R37} | $V_{CC1} = 4.75V$, at recording | 58 | 73 | 88 | mA |
| Circuit current 2 | I_{R33} | $V_{CC2} = 8.20V$, at recording | 1.6 | 2.0 | 2.4 | mA |
| Circuit current 1 | I_{P37} | $V_{CC1} = 4.75V$, at recording | 61 | 77 | 93 | mA |
| Circuit current 2 | I_{P33} | $V_{CC2} = 8.20V$, at recording | 1.6 | 2.0 | 2.4 | mA |
| Line AGC output level Lch, Rch | V_{OALL} V_{OALR} | $V_{IN} = 20dBs$ $f = 400Hz$ | -8 | -7 | -6 | dBs |
| Line AGC output distortion rate Lch, Rch | T_{HALL1} T_{HALR1} | $V_{IN} = 20dBs$ $f = 1kHz$, THD 5th | — | 0.02 | 0.1 | % |
| AGC ON output level Lch, Rch | V_{OALL2} V_{OALR2} | $V_{IN} = -20dBs$ $f = 400Hz$ | -4 | -1 | +2 | dBs |
| AGC ON output distortion rate Lch, Rch | T_{HALL2} T_{HALR2} | $V_{IN} = -20dBs$ $f = 1kHz$, THD 5th | — | 0.2 | 0.4 | % |
| Line AGC output noise Lch, Rch | V_{NALL} V_{NALR} | No input A curve filter | — | -78 | -74 | dBs |
| Fade control maximum attenuation output Lch, Rch | V_{FALL} V_{FALR} | $V_{IN} = -20dBs$, 1kHz A curve filter | — | -80 | -75 | dBs |
| Line through monitor output level Lch, Rch | V_{OILL} V_{OILR} | $V_{IN} = -20dBs$, 400Hz | -8 | -7 | -6 | dBs |
| Line through monitor output noise Lch, Rch | V_{NLLL} V_{NLLR} | No input A curve filter | — | -81 | -77 | dBs |
| Between inputs between channels crosstalk | V_{CTIN} | $V_{IN} = -14dBs$, 1kHz A curve filter | — | -78 | -74 | dBs |
| E-E monitor output frequency characteristics Lch, Rch | V_{OLFL} V_{OLFR} | $V_{IN} = -20dBs$ ratio of 40kHz/400Hz | — | -5.5 | -2.5 | dB |
| HP output level $V_{OL} = CENTER$ Lch, Rch | V_{HC8L} V_{HC8R} | $V_{IN} = -20dBs$, 400Hz 8Ω load | -28 | -26 | -24 | dBs |
| HP output distortion factor $V_{OL} = CENTER$ Lch, Rch | T_{HHC8L} T_{HHC8R} | $V_{IN} = -20dBs$, 1kHz 8Ω load, THD 5th | — | 0.05 | 0.5 | % |
| HP output level $V_{OL} = max.$ Lch, Rch | V_{HH8L} V_{HH8R} | $V_{IN} = -20dBs$, 400Hz 8Ω load | -18 | -16 | -14 | dBs |
| HP output level $V_{OL} = min.$ Lch, Rch | V_{HL8L} V_{HL8R} | $V_{IN} = -20dBs$, 400Hz 8Ω load | — | -96 | -92 | dBs |
| HP output noise voltage $V_{OL} = CENTER$ Lch, Rch | V_{NHCOL} V_{NHCOR} | No input A curve filter | — | -96 | -92 | dBs |
| HP maximum output level $V_{OL} = CENTER$ Lch, Rch | V_{MH8L} V_{MH8R} | 1kHz, at 1% distortion, 8Ω load THD 5th | -18 | — | — | dBs |
| Encode output level Lch, Rch | V_{ORLL} V_{ORLR} | $V_{IN} = -20dBs$, 400Hz BIL mode | -18 | -15 | -12 | dBs |
| Encode output distortion factor Lch, Rch | T_{HORLL} T_{HORLR} | $V_{IN} = -20dBs$, 1kHz to THD 5th | — | 0.2 | 0.4 | % |
| Encode linearity Lch, Rch | V_{OXLL} V_{OXLR} | $V_{IN} = -11.2/-51.2dBs$ $f = 400Hz$ | -21 | -20 | -19 | dB |
| SP encode f characteristics Lch, Rch | V_{FORLL} V_{FORLR} | $V_{IN} = -20dBs$ $f = 10kHz/400Hz$ | 3.8 | 4.8 | 5.8 | dB |
| LP encode f characteristics Lch, Rch | V_{FLRLL} V_{FLRLR} | $V_{IN} = -20dBs$, 10kHz ratio of LP/SP | 2.0 | 3.0 | 4.0 | dB |
| Encode output noise Lch, Rch | V_{NRLL} V_{NRRR} | No input A curve filter | — | -55 | -51 | dB |
| ST/BIL level difference L + R Lch | V_{BSRLL} | $V_{IN} = -20dBs$, 400Hz | -0.5 | 0 | +0.5 | dB |
| ST/BIL level difference L - R Rch | V_{BSRLR} | $V_{IN} = -20dBs$, 400Hz 30kHz LPF | — | -30 | -17.5 | dB |
| MON/BIL level difference Lch | V_{BMRLR} | $V_{IN} = -20dBs$, 400Hz | -0.5 | 0 | +0.5 | dB |
| Decode reference output level Lch, Rch | V_{OLPL} V_{OLPR} | V_{OLL} , input V_{ORLR} | -9.5 | -7 | -4.5 | dB |


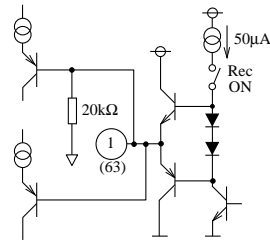

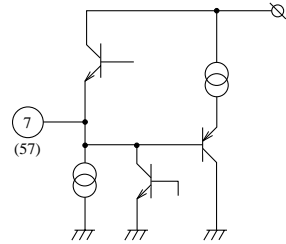

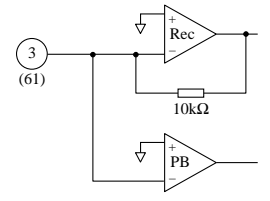

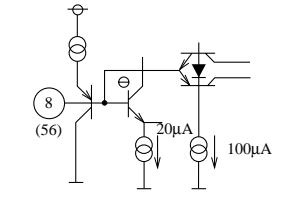

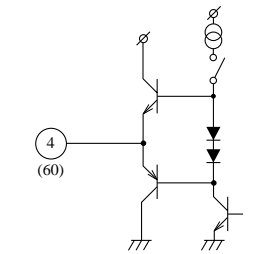

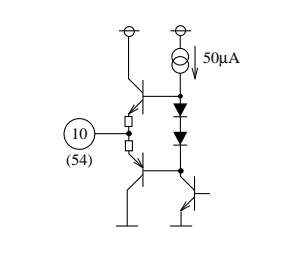

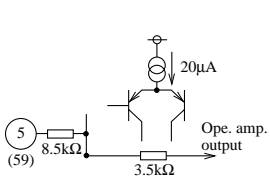

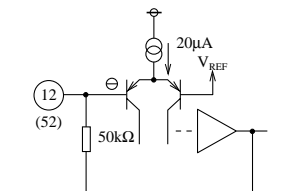

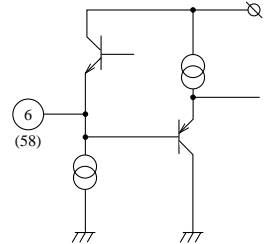

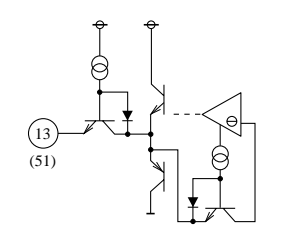
■ Electrical Characteristics (cont.) ($V_{CC1}=4.75V$, $V_{CC2}=8.2V$, $T_a=25\pm 2^\circ C$) (AN3986FBP)

| Parameter | Symbol | Condition | min | typ | max | Unit |
|---------------------------------------------------|----------------------------|----------------------------------------------------------|-------|------|-------|-------------------|
| Decode reference output distortion rate Lch, Rch | T_{HOLPL} T_{HOLPR} | V_{ORLL} , input V_{ORLR} | — | 0.12 | 0.3 | % |
| Decode linearity Lch, Rch | V_{OXPL} V_{OXPR} | $V_{IN}=-11.6/-41.6dBs$ $f=400Hz$ | -63 | -60 | -57 | dB |
| Decode output noise Lch, Rch | V_{NLPL} V_{NLPR} | No input A curve filter | — | -87 | -79 | dBs |
| Crosstalk Lch, Rch, at playback | C_{ERL} C_{ERR} | $V_{IN}=-20dBs$, 1kHz A curve filter | — | — | -79 | dBs |
| Maximum output level Lch, Rch, at playback | V_{OLML} V_{OLMR} | $V_{IN}=-10dBs$, 1kHz THD 5th | — | 0.4 | 1.0 | % |
| Line mute attenuation quantity Lch, Rch | V_{MLML} V_{MLMR} | $V_{IN}=-20dBs$, 1kHz A curve filter | — | -92 | -87 | dBs |
| Encode channel crosstalk Lch, Rch | S_{ERL} S_{ERR} | $V_{IN}=-14dBs$, 1kHz A curve filter | — | -50 | -47 | dBs |
| E-E system monitor output channel balance | B_{AL} | V_{OALR}/V_{OALL} | -0.55 | 0 | +0.55 | dB |
| Encode output channel balance | B_{RE} | V_{ORLR}/V_{ORLL} | -2 | 0 | +2 | dB |
| Decode output channel balance | B_{LP} | V_{OLPR}/V_{OLPL} | -3 | 0 | +3 | dB |
| VCO free-run frequency Lch | F_{OL} | $R=8.2k\Omega$ | 1.35 | 1.50 | 1.65 | MHz |
| VCO free-run frequency Rch | F_{OR} | $R=6.8k\Omega$ | 1.55 | 1.70 | 1.85 | kHz |
| VCO output amplitude voltage Lch | V_{83} | when $f=1.5MHz$ | 456 | 500 | 548 | mV _{P-P} |
| VCO output amplitude voltage Rch | V_{65} | when $f=1.7MHz$ | 410 | 450 | 493 | mV _{P-P} |
| VCO 2nd harmonics output Lch | V_{83-2} | fundamental wave as 0dB | — | -50 | -35 | dB |
| VCO 2nd harmonics output Rch | V_{65-2} | fundamental wave as 0dB | — | -50 | -35 | dB |
| VCO 3rd harmonics output Lch | V_{83-3} | fundamental wave as 0dB | — | -50 | -40 | dB |
| VCO 3rd harmonics output Rch | V_{65-3} | fundamental wave as 0dB | — | -50 | -40 | dB |
| VCO reference frequency deviation Lch | F_{DOL} | $\Delta V=\pm 195.2mV$ (-15dBs equivalent) | 90 | 120 | 150 | kHz |
| VCO reference frequency deviation Rch | F_{DOR} | $\Delta V=\pm 195.2mV$ (-15dBs equivalent) | 45 | 60 | 75 | kHz |
| Maximum frequency deviation 1 Lch | F_{DLMX1} | input $\Delta V=-617mV$ (-5dBs equivalent) | 96 | 110 | 128 | kHz |
| Maximum frequency deviation 2 Lch | F_{DLMX2} | input $\Delta V=+617mV$ (-5dBs equivalent) | -128 | -110 | -96 | kHz |
| Maximum frequency deviation 1 Rch | F_{DRMX1} | input $\Delta V=-617mV$ (-5dBs equivalent) | 48 | 55 | 64 | kHz |
| Maximum frequency deviation 2 Rch | F_{DRMX2} | input $\Delta V=+617mV$ (-5dBs equivalent) | -64 | -55 | -48 | kHz |
| Boost start time Lch, Rch, at recording | T_{BSL} T_{BSR} | time from PG input | — | — | 200 | μs |
| Boost level Lch, Rch | V_{BSL} V_{BSR} | level difference due to gain-up | 6 | — | 9 | dB |
| Boost width Lch, Rch | T_{BEL} T_{BER} | time of gain-up | 1.1 | 1.3 | 1.5 | ms |
| Reference FM modulation distortion ratio Lch, Rch | T_{HDL} T_{HDR} | $V_{IN}=-15dBs$, $f=1kHz$ THD 5th after demodulation | — | — | 0.3 | % |
| FM demodulation output voltage Lch | V_{DEL1} | $DEV=\pm 60kHz$ $f_m=400Hz$ | -18 | -15 | -12 | dBs |
| FM demodulation output voltage Rch | V_{DER1} | $DEV=\pm 30kHz$ $f_m=400Hz$ | -18 | -15 | -12 | dBs |
| FM demodulation output distortion ratio Lch | T_{HDEL1} | $DEV=\pm 60kHz$ $f_m=1kHz$ | — | — | 0.3 | % |
| FM demodulation output distortion ratio Rch | T_{HDER1} | $DEV=\pm 30kHz$ $f_m=1kHz$ | — | — | 0.3 | % |
| Dropout detection ON level | DODON | $V_{IN}=30mV_{P-P}$ as 0dB $f=1.5MHz$ | -11 | -14 | -18 | dB |

■ Electrical Characteristics (cont.) ($V_{CC1}=4.75V$, $V_{CC2}=8.2V$, $T_a=25\pm 2^\circ C$) (AN3986FBP)

| Parameter | Symbol | Condition | min | typ | max | Unit |
|-----------------------------------------------------|------------|--------------------------------------------------|------|------|------|---------|
| Dropout off hysteresis width | DODOFF | $V_{in}=30mV_{P-P}$ as 0dB | 2 | 4 | 6 | dB |
| MUTE change-over ON level | MUTON | $V_{in}=30mV_{P-P}$ as 0dB $f=1.5MHz$ | -9 | -12 | -16 | dB |
| MUTE OFF hysteresis | MUTOFF | $V_{in}=30mV_{P-P}$ as 0dB | 1 | 3 | 5 | dB |
| AUTO MONO detection level | V_{ATMS} | $V_{in}=30mV_{P-P}$ as 0dB $f=1.7MHz$ | -9 | -12 | -16 | dB |
| AUTO MONO OFF hysteresis | V_{ATME} | $V_{in}=30mV_{P-P}$ as 0dB | 0.5 | 2.0 | 4 | dB |
| Hold start time Lch | T_{HOSL} | time from PG input to hold start | 1.0 | 1.5 | 2.0 | μs |
| Hold start time Rch | T_{HOSR} | | 1.0 | 1.5 | 2.0 | μs |
| Hold end time Lch | T_{HOFL} | time from PG input to hold end | 8.5 | 10.0 | 11.5 | μs |
| Hold end time Rch | T_{HOFR} | | 12.2 | 14.0 | 15.8 | μs |
| Bilingual discrimination level | V_{BIS1} | Boost level | 3 | — | — | dB |
| Bilingual discrimination level hysteresis | V_{BIE1} | | 0.5 | 2 | 4 | dB |
| Self recording playback level Lch | V_{RPL} | $V_{in}=-20dBs$, $f=400Hz$ bilingual MODE | -9.5 | -7.0 | -4.5 | dBs |
| Self recording playback level Rch | V_{RPR} | | -8.5 | -6.0 | -3.5 | dBs |
| Self recording playback level (R/L) channel balance | B_{RPL} | $V_{in}=-20dBs$, $f=400Hz$ V_{RPR}/V_{RPL} | 0 | 1.0 | 2.0 | dB |
| Rec holding voltage | V_{23R} | | 0 | — | 1.4 | V |
| PB holding voltage | V_{23P} | | 3.4 | — | 4.75 | V |
| Line MUTE ON voltage | V_{19MN} | | 3.4 | — | 4.75 | V |
| Line MUTE OFF voltage | V_{19MF} | | 0 | — | 1.4 | V |
| Input change-over selection voltage LINE 1 | V_{201} | | 3.9 | — | 4.75 | V |
| Input change-over selection voltage LINE 2 | V_{202} | | 2.1 | — | 2.7 | V |
| Input change-over selection voltage LINE 3 | V_{203} | | 0 | — | 0.8 | V |
| SP mode holding voltage | V_{44S} | | 3.4 | — | 4.75 | V |
| LP mode holding voltage | V_{44L} | | 0 | — | 1.4 | V |
| Output change-over selection voltage Lch | V_{45H} | | 3.9 | — | 4.75 | V |
| Output change-over selection voltage Rch | V_{45M} | | 2.1 | — | 2.7 | V |
| Output change-over selection voltage STE | V_{45L} | | 0 | — | 0.8 | V |
| Matrix control holding voltage ON | V_{46H} | | 3.9 | — | 4.75 | V |
| Matrix control holding voltage AUTO | V_{46M} | | 2.1 | — | 2.7 | V |
| Matrix control holding voltage OFF | V_{46L} | | 0 | — | 0.8 | V |
| PG input voltage high level | V_{78H} | | 3.4 | — | 4.75 | V |
| PG input voltage low level | V_{78L} | | 0 | — | 1.4 | V |
| Discrimination output voltage BIL | V_{18H} | | 3.4 | — | 4.75 | V |
| Discrimination output voltage MON | V_{18M} | | 1.5 | — | 2.6 | V |
| Discrimination output voltage STE | V_{18L} | | 0 | — | 0.8 | V |

■ Pin Descriptions (V_{CC} or GND pins are not shown)

| Pin No. | Waveform · Voltage | Equivalent circuit | Pin No. | Waveform · Voltage | Equivalent circuit |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1 [1] · 63 [60] |  2.38 VDC, Rec NR output |  | 7 [7] · 57 [54] |  |  |
| 3 [3] · 61 [58] |  DC 2.38V |  | 8 [8] · 56 [53] |  DC 1.65V L.S IN |  |
| 4 [4] · 60 [57] |  DC 2.38V |  | 10 [10] · 54 [51] |  DC 2.38V LPF OUT |  |
| 5 [5] · 59 [56] |  DC 2.38V LP EMPH |  | 12 [11] · 52 [50] |  DC 2.38V CCA IN |  |
| 6 [6] · 58 [55] |  |  | 13 [12] · 51 [49] |  DC 2.38V CCA OUT |  |


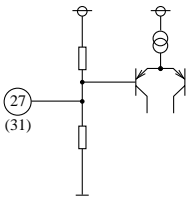

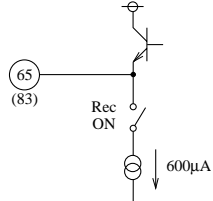

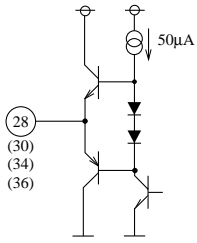
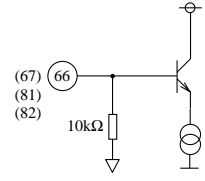

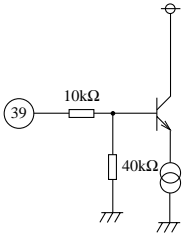

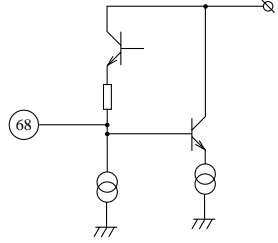

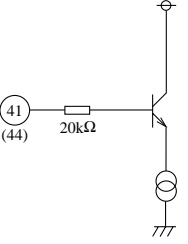
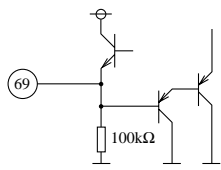

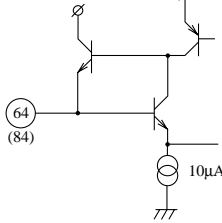

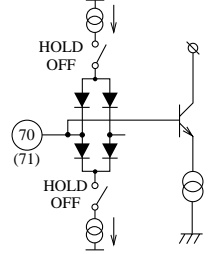
Note) The indicated values are typical ones, and may depend on operating conditions or individual IC.
 $V_{CC1} = 4.75V$, and $V_{CC2} = 8.2V$
 A number without a square denotes a pin No. of the AN3986FBP, while a number with a square denotes a pin No. of the AN3986FHP.

■ Pin Descriptions (cont.) (V_{CC} or GND pins are not shown)

| Pin No. | Waveform · Voltage | Equivalent circuit | Pin No. | Waveform · Voltage | Equivalent circuit |
|----------------------|------------------------------|--------------------|----------------------------------------------------------------------|--------------------|--------------------|
| 14 13 50 48 | ~ DC 2.38V CCA IN | | 19 18 | MUTE SW | |
| 15 14 49 47 | ~ 2.38 VDC, Buffer OUT | | 20 19 45 43 46 44 | — | |
| 16 15 46 | ~ DC 2.38V | | 22 21 24 23 26 25 38 36 40 38 42 40 | DC 2.38V | |
| 17 16 45 | ~ DC 2.38V | | 23 22 | R/P SW | |
| 18 17 | — | | 25 24 | — | |

Note) The indicated values are typical ones, and may depend on operating conditions or individual IC.
 $V_{CC1}=4.75V$, and $V_{CC2}=8.2V$
 A number without a square denotes a pin No. of the AN3986FBP, while a number with a square denotes a pin No. of the AN3986FHP.

■ Pin Descriptions (cont.) (V_{CC} or GND pins are not shown)

| Pin No. | Waveform · Voltage | Equivalent circuit | Pin No. | Waveform · Voltage | Equivalent circuit |
|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 27 [26] · 31 [30] |  $V_{REF IN}$ |  | 65 [62] · 83 [79] |  DC $f=1.5\text{MHz}$ (1.7MHz) FM modulation output |  |
| 28 [27] · 30 [29] · 34 [32] · 36 [34] |  DC 2.38V 4.1V |  | 66 [63] · 67 [64] · 81 [77] · 82 [78] | DC 2.38V RF IN |  |
| 39 [37] |  |  | 68 [65] |  |  |
| 41 [39] · 44 [42] |  |  | 69 [66] | 4VDC when not active, and 0VDC when active |  |
| 64 [61] · 84 [80] |  DC 2.3V |  | 70 [67] · 71 [68] |  |  |

Note) The indicated values are typical ones, and may depend on operating conditions or individual IC.
 $V_{CC1}=4.75\text{V}$, and $V_{CC2}=8.2\text{V}$
 A number without a square denotes a pin No. of the AN3986FBP, while a number with a square denotes a pin No. of the AN3986FHP.

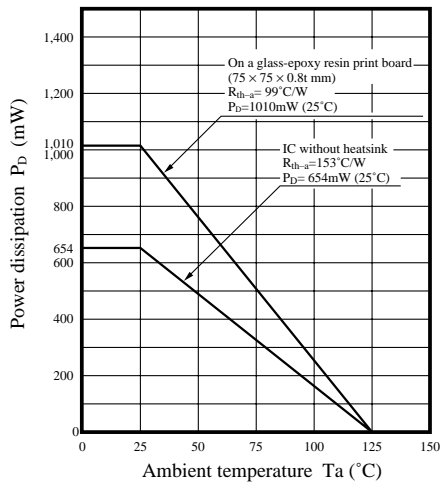
■ Pin Descriptions (cont.) (V_{CC} or GND pins are not shown)

| Pin No. | Waveform · Voltage | Equivalent circuit | Pin No. | Waveform · Voltage | Equivalent circuit |
|----------|---------------------|--------------------|----------|--------------------|--------------------|
| 73 70 | | | 72 69 | — | |
| 76 72 | | | 79 75 | — | |
| 78 74 | f=30Hz, square wave | | — | — | — |

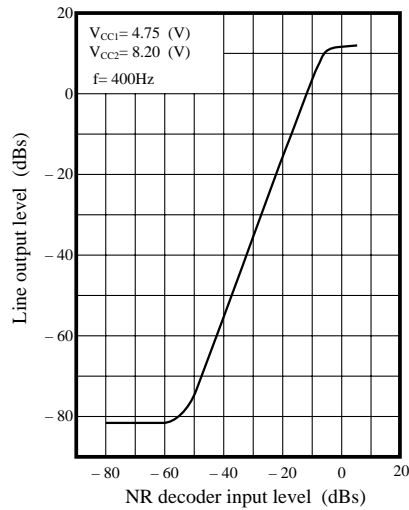
Note) The indicated values are typical ones, and may depend on operating conditions or individual IC.
 $V_{CC1} = 4.75V$, and $V_{CC2} = 8.2V$
 A number without a square denotes a pin No. of the AN3986FBP, while a number with a square denotes a pin No. of the AN3986FHP.

■ Reference

Power dissipation for the package
AN3986FHP $P_D - T_a$

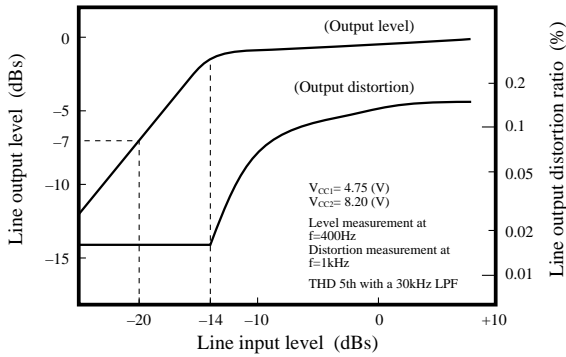


NR decoder linearity characteristics

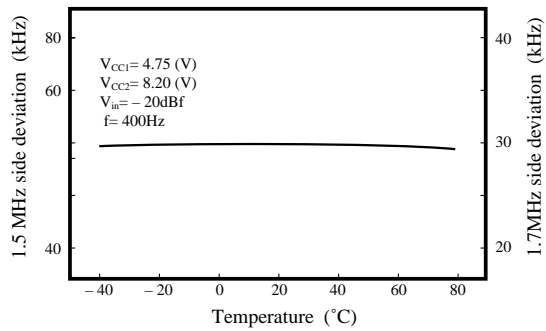


■ Reference (cont.)

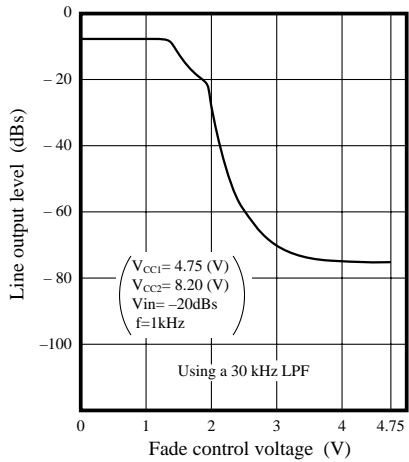
Line AGC input/output characteristics



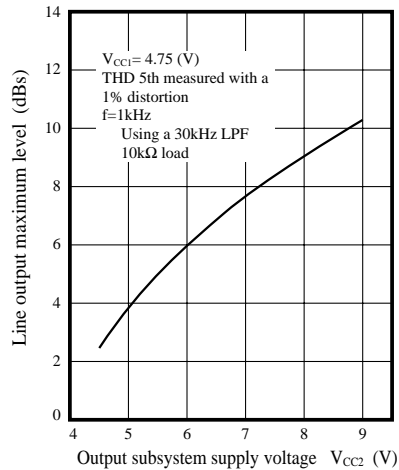
Temperature characteristics of FM record output deviation



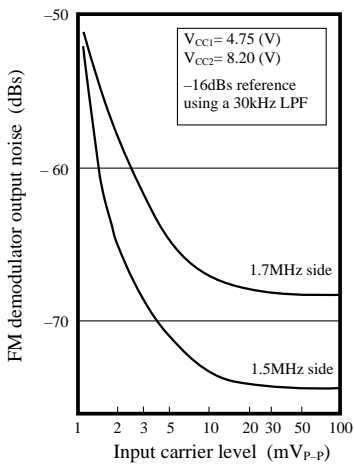
Fade control output characteristics



Line maximum output level



Carrier level vs. FM demodulator output noise



Headphone volume control output

