# AN7298FBP

## FM-IF, NC, and MPX IC for car radio

### ■ Overview

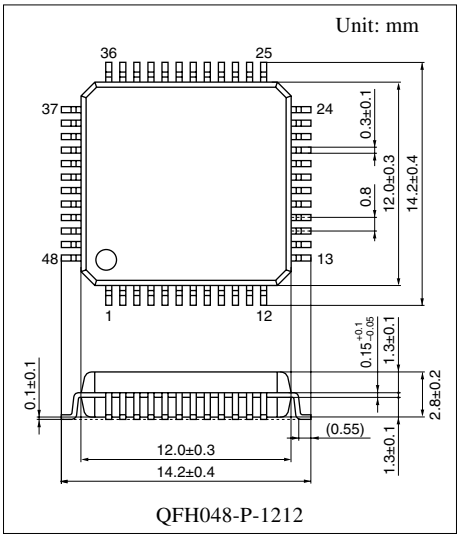
The AN7298FBP is an IC for car radio. The FM-IF, NC (Noise Canceler) and MPX functions are integrated into a single chip. The IC has the higher functions than our conventional IC (AN7292NSC) and the characteristics of multi-pass detection, mute and SD functions are improved.

### ■ Features

- IF sensitivity is high. (limiting sensitivity 26 dBμ)
- Adjustment-free VCO (912 kHz)
- Good linearity of S-meter output (adjusting funciton)

### ■ Applications

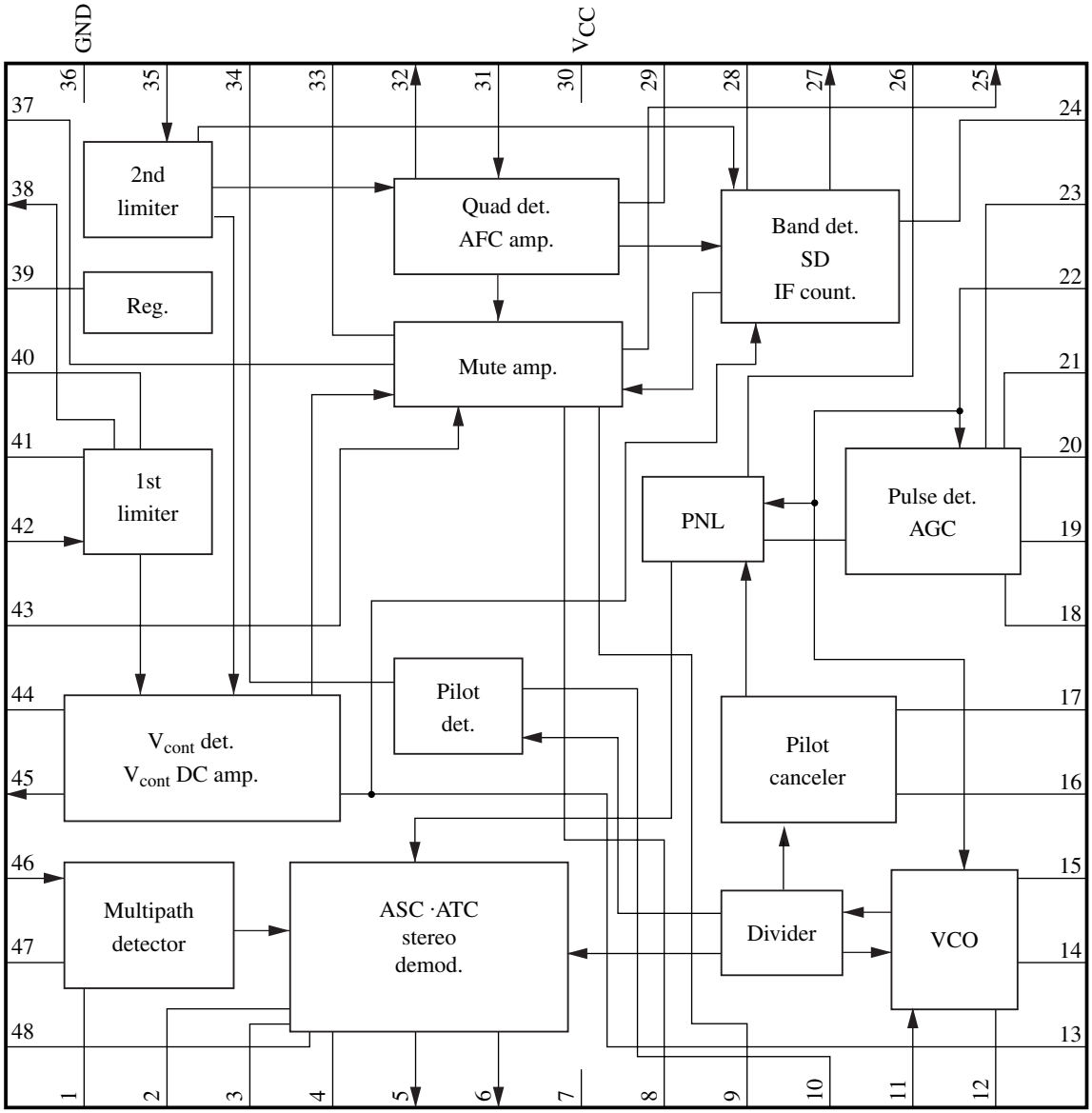
- Car radios




QFH048-P-1212

Note) The package of this product will be changed to lead-free type (QFH048-P-1212B). See the new package dimensions section later of this datasheet.

■ Block Diagram



## ■ Pin Descriptions

| Pin No. | Description | Pin No. | Description |
|---|---|---|---|
| 1 | ASC adjustment | 25 | IF detection output |
| 2 | ATC adjustment | 26 | PNL output hold |
| 3 | Separation adjustment | 27 | SD/IF counter output |
| 4 | ATC LPF | 28 | SD sensitivity adjustment |
| 5 | R-ch. output | 29 | AFC output |
| 6 | L-ch. output | 30 | $V_{CC}$ |
| 7 | Control voltage output | 31 | IF detection coil |
| 8 | Band mute control | 32 | Limiter output |
| 9 | Soft mute filter | 33 | Soft mute adjustment |
| 10 | Phase detection filter1 | 34 | Stereo lamp drive |
| 11 | Forced monaural | 35 | 2nd limiter output |
| 12 | Phase detection filter 2-1 | 36 | GND |
| 13 | SD startup time constant setting | 37 | Mute adjustment |
| 14 | Phase detection filter 2-2 | 38 | 1st limiter |
| 15 | VCO | 39 | Reference voltage |
| 16 | Phase detection filter 3 | 40 | 1st limiter output GND |
| 17 | Pilot canceler negation filter | 41 | 1st limiter bias |
| 18 | PNL LPF | 42 | IF input |
| 19 | PNL LPF | 43 | Mute slope adjustment |
| 20 | PNL gate pulse filter | 44 | Control voltage adjustment |
| 21 | PNL AGC | 45 | Control voltage output |
| 22 | PNL input | 46 | Control voltage input |
| 23 | PNL HPF | 47 | ASC |
| 24 | IF-counter output stop | 48 | Control voltage detection |

## ■ Absolute Maximum Ratings

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Supply voltage | $V_{CC}$ | 9.7 | V |
| Supply current | $I_{CC}$ | 48 | mA |
| Power dissipation *2 | $P_D$ | 301 | mW |
| Operating ambient temperature *1 | $T_{opr}$ | −30 to +80 | °C |
| Storage temperature *1 | $T_{stg}$ | −55 to +125 | °C |

Note) ∗1 : All parameter values except for the power dissipation, the operating ambient temperature and the storage temperature are $T_a$ = 25°C.

*2 : Power dissipation of IC alone at $T_a$ = 80°C.

■ Recommended Operating Range

| Parameter | Symbol | Range | Unit |
|---|---|---|---|
| Supply voltage | $V_{CC}$ | 7.2 to 9.6 | V |

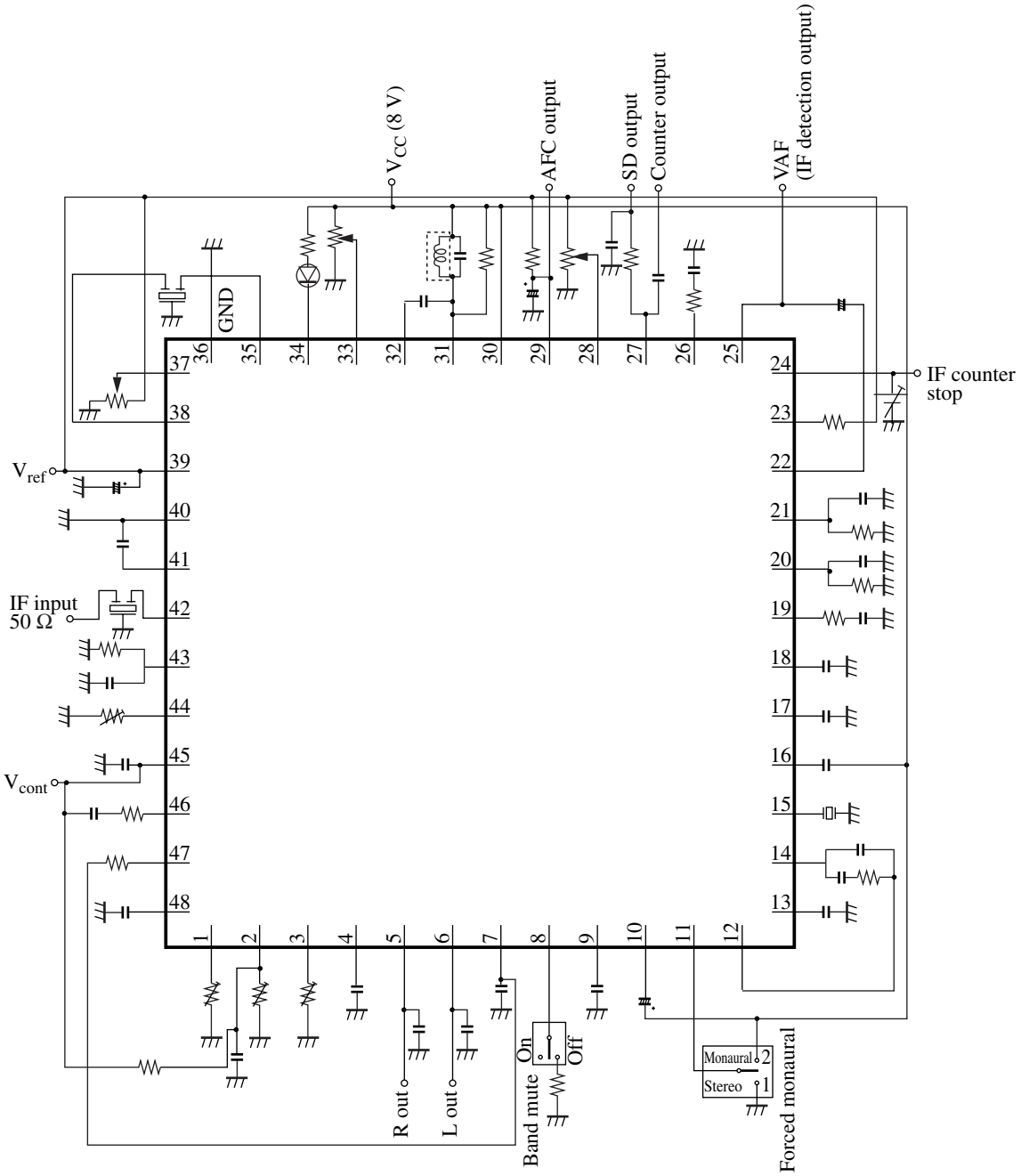
■ Electrical Characteristics at $V_{CC}$ = 8 V, $f_{IN}$ = 10.70 MHz, $f_{mod}$ = 1 kHz 30%FM, $T_a$ = 25°C

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Control voltage 1 | $V_{C1}$ | Without input, pin 45 DC voltage | 0.05 | 0.50 | 0.90 | V |
| Control voltage 2 | $V_{C2}$ | $V_{IN}$ = 40 dBμ, pin 45 DC voltage | 1.20 | 1.65 | 2.10 | V |
| Control voltage 3 | $V_{C3}$ | $V_{IN}$ = 70 dBμ, pin 45 DC voltage | 2.75 | 3.45 | 4.15 | V |
| Control voltage 4 | $V_{C4}$ | $V_{IN}$ =100 dBμ, pin 45 DC voltage | 4.45 | 5.35 | 6.25 | V |
| Control voltage 5 | $V_{C5}$ | $V_{C5} = V_{C3} - V_{C2}$ | 1.60 | 1.80 | 2.00 | V |
| Control voltage 6 | $V_{C6}$ | $V_{C6} = V_{C4} - V_{C3}$ | 1.70 | 1.90 | 2.10 | V |
| AFC offset voltage | $V_{AFC}$ | Without input, DC voltage between pin 29 and pin 39 | – 0.1 | 0.0 | 0.1 | V |
| Output level L | $V_{OL}$ | $V_{IN}$ = 70dBμ, pin 6 AC voltage | 90 | 110 | 130 | mV[rms] |
| Output level R | $V_{OR}$ | $V_{IN}$ = 70dBμ, pin 5 AC voltage | 90 | 110 | 130 | mV[rms] |
| Channel balance | CB | CB = 20Log ($V_{OL}$ /$V_{OR}$) | –1.0 | 0.0 | 1.0 | dB |
| Limiting sensitivity | $V_{lim}$ | $V_{OL}$ to 0 dB. Input when pin 6 AC voltage drops by 3 dB | 20.0 | 26 | 30.0 | dBμ |
| Residual pilot voltage | $V_{PC}$ | Pin 26 output when $V_{IN}$ = 70 dBμ, pilot signal 10% modulation | — | 4 | 14.0 | mV[rms] |
| Stereo lamp on-level | $Lamp_{ON}$ | Modulation with pilot signal only, DC voltage of pin 34 is below 2 V | 1.0 | 3.5 | 6.0 | % |
| Stereo lamp off-level | $Lamp_{OFF}$ | Modulation with pilot signal only. Ratio of stereo lamp on and off level | 2.0 | 6.0 | 10.0 | dB |
| Separation L-ch. | $Sep_L$ | $V_{IN}$ = 70 dBμ, L+R = 90% Pilot 10% | 25 | 33 | — | dB |
| Separation R-ch. | $Sep_R$ | $V_{IN}$ = 70 dBμ, L+R = 90% Pilot 10% | 25 | 33 | — | dB |
| Capture range | CR | $V_{IN}$ = 70 dBμ, pilot signal 6.5% modulation | +0.6<br>–0.2 | +0.8<br>0.4 | — | % |
| Counter output level 1 | $V_{IF1}$ | $V_{IN}$ = 70 dBμ, pin 28 = 0V, pin 27 10.7 MHz, output voltage | 0 | 2.0 | 5.0 | mV[rms] |
| Counter output level 2 | $V_{IF2}$ | $V_{IN}$ = 70 dBμ, pin 28 = $V_{CC}$, pin 27 AC output voltage | 85 | 100 | 115 | mV[rms] |
| Power supply current | $I_{tot}$ | Without input, pin 11 = 0 V | 28.0 | 35.0 | 42.0 | mA |
| Monaural THD (L-ch.) | $THD_L$ | Monaural input 400 mV, 1kHz, L-ch. distortion | — | 0.15 | 0.3 | % |
| Monaural THD (R-ch.) | $THD_R$ | Monaural input 400 mV, 1kHz, R-ch. distortion | — | 0.15 | 0.3 | % |

■ Electrical Characteristics at $V_{CC}$ = 8 V, $f_{IN}$ = 10.70 MHz, $f_{mod}$ = 1 kHz 30%FM, $T_a$ = 25°C (continued)

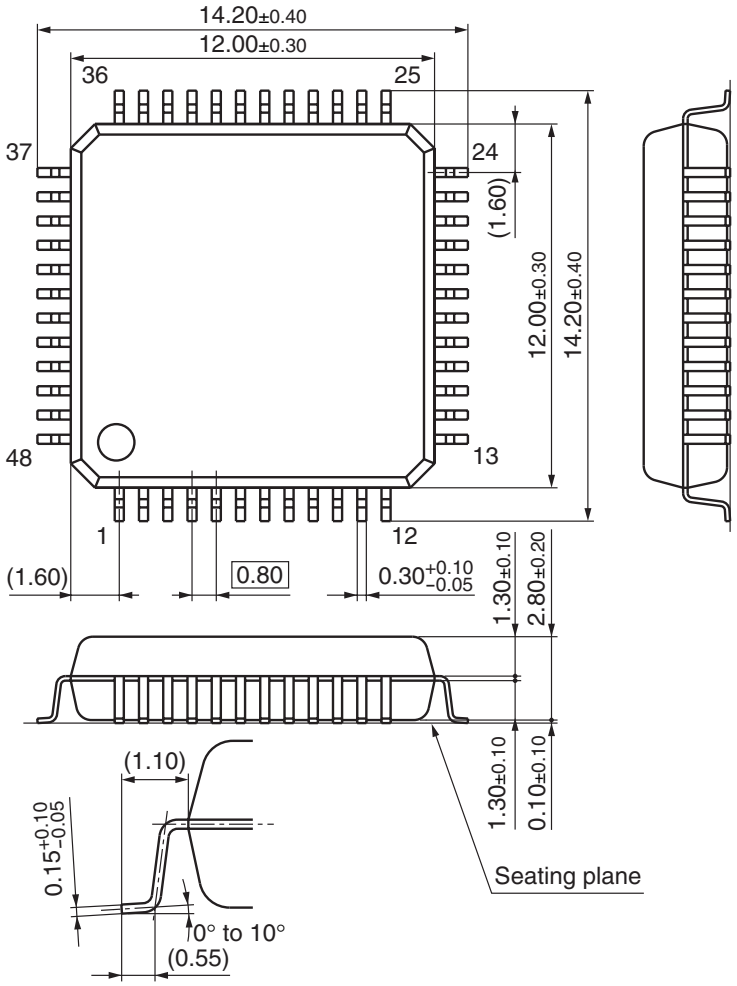
| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Stereo THD (L-ch.) | $THD_{SL}$ | Stereo, L+R = 360 mV, $V_P$ = 40 mV, L-ch. distortion | — | 0.15 | 0.3 | % |
| Stereo THD (R-ch.) | $THD_{SR}$ | Stereo, L+R = 360 mV, $V_P$ = 40 mV, R-ch. distortion | — | 0.15 | 0.3 | % |
| AGC voltage 1 | $V_{AGC1}$ | Input = 0, $R_S$ = 600 Ω, pin 21 DC voltage | — | 0.0 | 0.4 | V |
| AGC voltage 2 | $V_{AGC2}$ | Input $V_{IN2}$ = 2 mV[rms], 150 kHz, pin 21 DS voltage | 1.3 | 1.48 | 1.65 | V |
| Noise detection voltage | $V_{DET}$ | $V_{IN2}$ = 100 mV[rms],150 kHz, pin 20 DC voltage | — | 0.0 | 0.3 | V |
| Gate pulse width | PW | $V_{IN2}$ = 0.3 V[p-p], $t_W$=1 µs, f=1 kHz, pin 26 output pulse width | 19 | 24 | 29 | µs |
| Residual noise voltage | $V_{NR}$ | $V_{IN2}$ =1 V[p-p], $t_W$ =10 µs, f=1 kHz, input through LPF, L-ch. output | — | 0.0 | 1.2 | mV[rms] |
| SD bandwidth | SDW | Bandwidth when SD output (pin 27) is over 4.5 V, $V_{28}$ = 2.7 V | 110 | 140 | 170 | kHz |
| SD sensitivity | SDS | Input when SD output (pin 27) is over 4.5 V, $V_{28}$ = 2.7 V | 45 | 55 | 65 | dBµ |

■ Application Circuit Example



■ New Package Dimensions (Unit: mm)

• QFH048-P-1212B (Lead-free package)



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