

# AN7298FBP

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

## ■ Overview

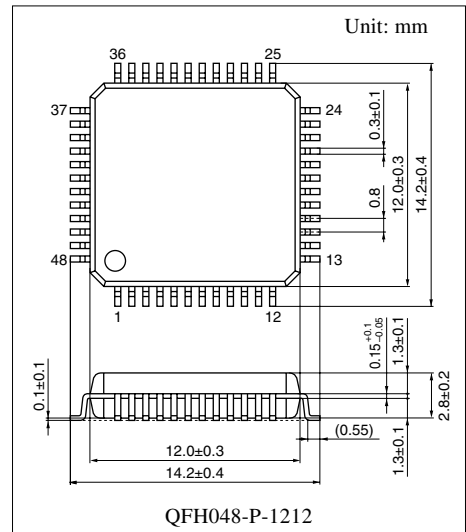
The AN7298FBP is an IC for car radio. The FM-IF, NC (Noise Canceler) and MPX functions are integrated into a single chip. The IC has the higher functions than our conventional IC (AN7292NSC) and the characteristics of multi-pass detection, mute and SD functions are improved.

## ■ Features

- IF sensitivity is high. (limiting sensitivity 26 dB $\mu$ )
- Adjustment-free VCO (912 kHz)
- Good linearity of S-meter output (adjusting function)

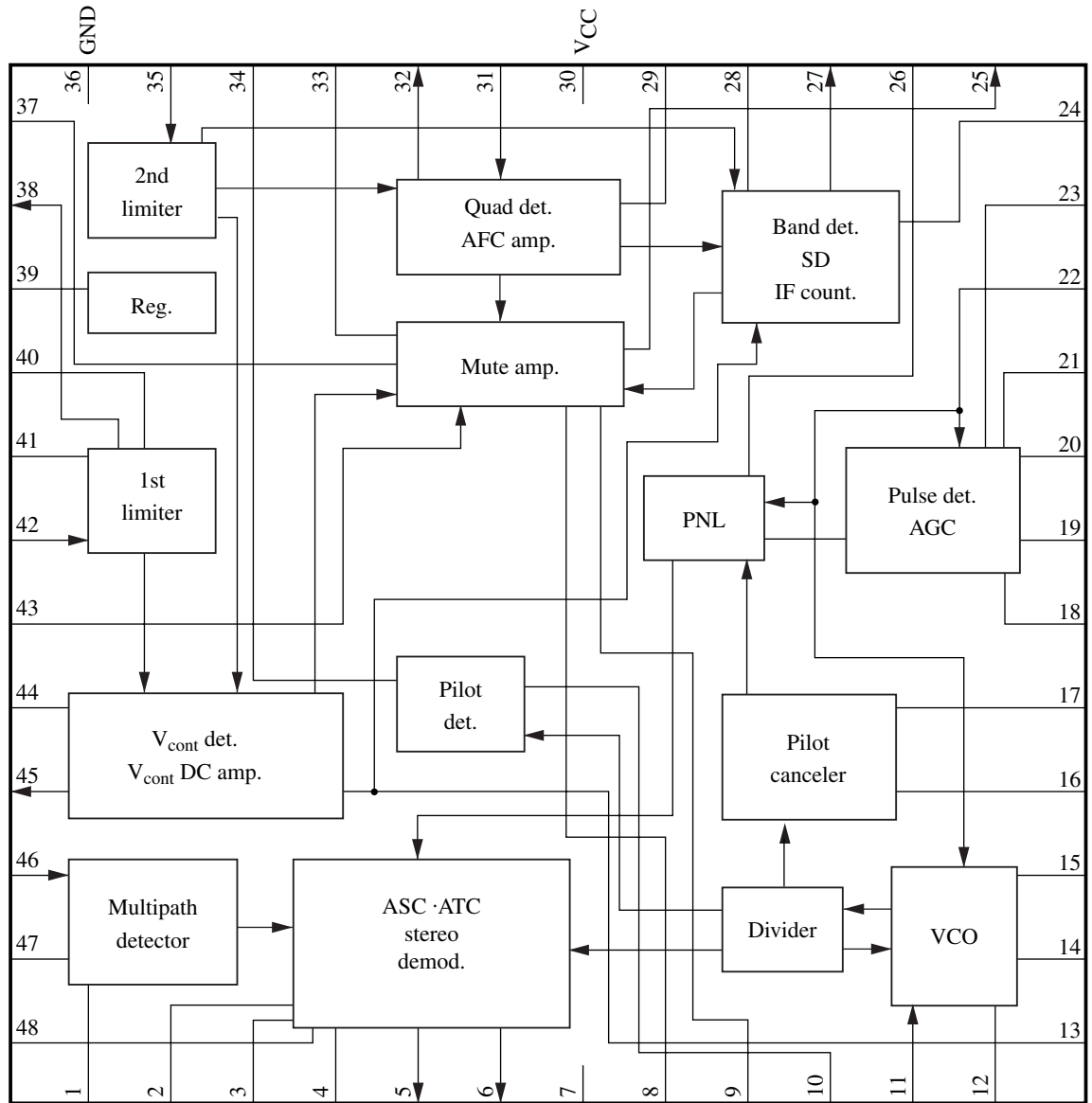
## ■ Applications

- Car radios



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 <sub>CC</sub>
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 <sub>CC</sub>	9.7	V
Supply current	I <sub>CC</sub>	48	mA
Power dissipation *2	P <sub>D</sub>	301	mW
Operating ambient temperature *1	T <sub>opr</sub>	-30 to +80	°C
Storage temperature *1	T <sub>stg</sub>	-55 to +125	°C

Note) \*1 : All parameter values except for the power dissipation, the operating ambient temperature and the storage temperature are T<sub>a</sub> = 25°C.

\*2 : Power dissipation of IC alone at T<sub>a</sub> = 80°C.

### ■ Recommended Operating Range

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

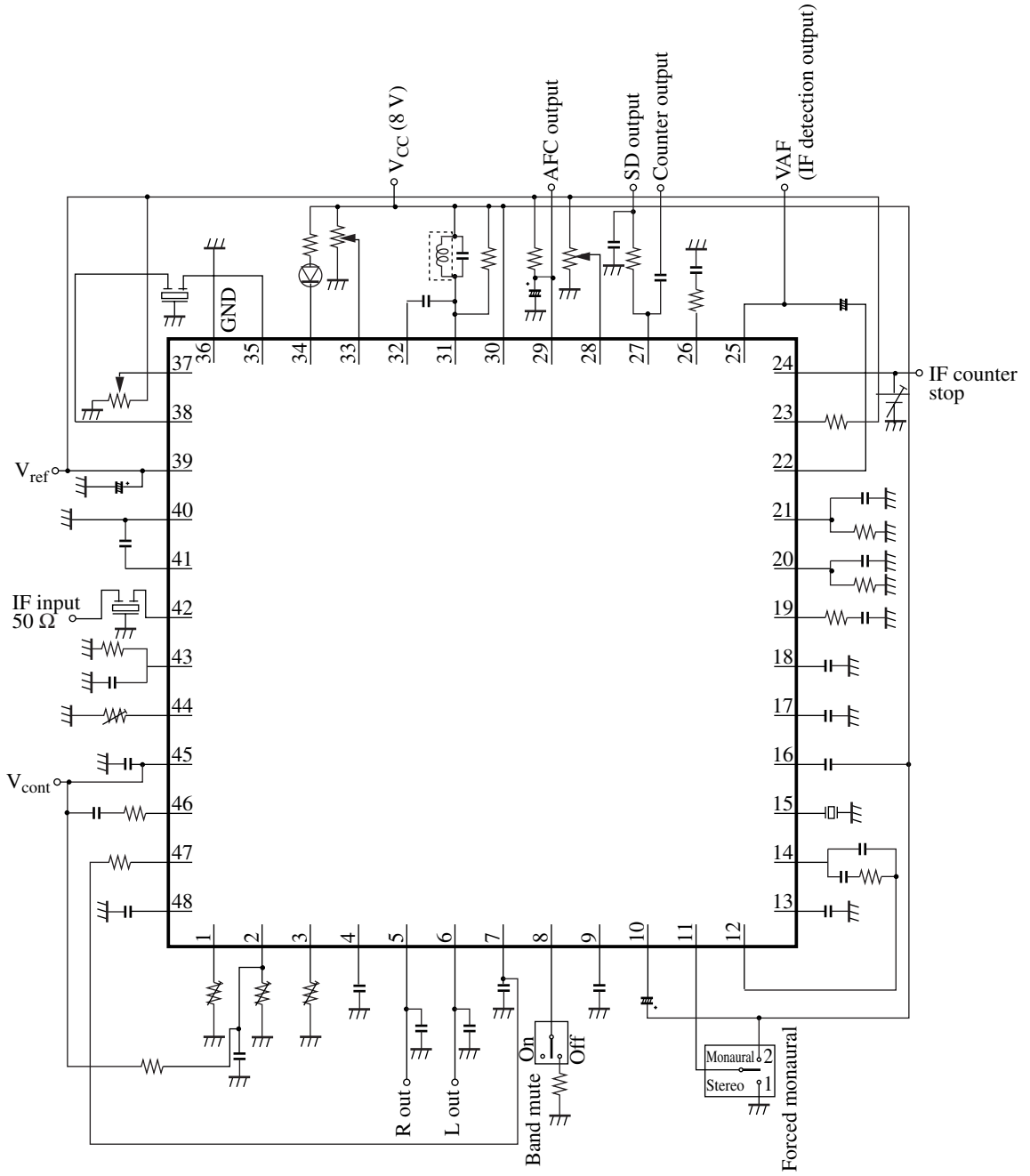
### ■ Electrical Characteristics at $V_{CC} = 8\text{ V}$ , $f_{IN} = 10.70\text{ MHz}$ , $f_{mod} = 1\text{ kHz}$ 30%FM, $T_a = 25^\circ\text{C}$

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	$V_{C2}$	$V_{IN} = 40\text{ dB}\mu$ , pin 45 DC voltage	1.20	1.65	2.10	V
Control voltage 3	$V_{C3}$	$V_{IN} = 70\text{ dB}\mu$ , pin 45 DC voltage	2.75	3.45	4.15	V
Control voltage 4	$V_{C4}$	$V_{IN} = 100\text{ dB}\mu$ , 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	$V_{OL}$	$V_{IN} = 70\text{ dB}\mu$ , pin 6 AC voltage	90	110	130	mV[rms]
Output level R	$V_{OR}$	$V_{IN} = 70\text{ dB}\mu$ , pin 5 AC voltage	90	110	130	mV[rms]
Channel balance	CB	$CB = 20\text{Log}(V_{OL}/V_{OR})$	-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	dB $\mu$
Residual pilot voltage	$V_{PC}$	Pin 26 output when $V_{IN} = 70\text{ dB}\mu$ , pilot signal 10% modulation	—	4	14.0	mV[rms]
Stereo lamp on-level	Lamp <sub>ON</sub>	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 <sub>OFF</sub>	Modulation with pilot signal only. Ratio of stereo lamp on and off level	2.0	6.0	10.0	dB
Separation L-ch.	Sep <sub>L</sub>	$V_{IN} = 70\text{ dB}\mu$ , L+R = 90% Pilot 10%	25	33	—	dB
Separation R-ch.	Sep <sub>R</sub>	$V_{IN} = 70\text{ dB}\mu$ , L+R = 90% Pilot 10%	25	33	—	dB
Capture range	CR	$V_{IN} = 70\text{ dB}\mu$ , pilot signal 6.5% modulation	+0.6 -0.2	+0.8 0.4	—	%
Counter output level 1	$V_{IF1}$	$V_{IN} = 70\text{ dB}\mu$ , pin 28 = 0V, pin 27 10.7 MHz, output voltage	0	2.0	5.0	mV[rms]
Counter output level 2	$V_{IF2}$	$V_{IN} = 70\text{ dB}\mu$ , 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 <sub>L</sub>	Monaural input 400 mV, 1kHz, L-ch. distortion	—	0.15	0.3	%
Monaural THD (R-ch.)	THD <sub>R</sub>	Monaural input 400 mV, 1kHz, R-ch. distortion	—	0.15	0.3	%

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Stereo THD (L-ch.)	THD <sub>SL</sub>	Stereo, L+R = 360 mV, $V_p = 40\text{ mV}$ , L-ch. distortion	—	0.15	0.3	%
Stereo THD (R-ch.)	THD <sub>SR</sub>	Stereo, L+R = 360 mV, $V_p = 40\text{ mV}$ , R-ch. distortion	—	0.15	0.3	%
AGC voltage 1	$V_{AGC1}$	Input = 0, $R_S = 600\ \Omega$ , pin 21 DC voltage	—	0.0	0.4	V
AGC voltage 2	$V_{AGC2}$	Input $V_{IN2} = 2\text{ mV[rms]}$ , 150 kHz, pin 21 DS voltage	1.3	1.48	1.65	V
Noise detection voltage	$V_{DET}$	$V_{IN2} = 100\text{ mV[rms]}$ , 150 kHz, pin 20 DC voltage	—	0.0	0.3	V
Gate pulse width	PW	$V_{IN2} = 0.3\text{ V[p-p]}$ , $t_w = 1\ \mu\text{s}$ , $f = 1\text{ kHz}$ , pin 26 output pulse width	19	24	29	$\mu\text{s}$
Residual noise voltage	$V_{NR}$	$V_{IN2} = 1\text{ V[p-p]}$ , $t_w = 10\ \mu\text{s}$ , $f = 1\text{ kHz}$ , 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, $V_{28} = 2.7\text{ V}$	110	140	170	kHz
SD sensitivity	SDS	Input when SD output (pin 27) is over 4.5 V, $V_{28} = 2.7\text{ V}$	45	55	65	dB $\mu$

■ Application Circuit Example





## Request for your special attention and precautions in using the technical information and semiconductors described in this material

- (1) An export permit needs to be obtained from the competent authorities of the Japanese Government if any of the products or technologies described in this material and controlled under the "Foreign Exchange and Foreign Trade Law" is to be exported or taken out of Japan.
- (2) The technical information described in this material is limited to showing representative characteristics and applied circuit examples of the products. It does not constitute the warranting of industrial property, the granting of relative rights, or the granting of any license.
- (3) The products described in this material are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).  
Consult our sales staff in advance for information on the following applications:
  - Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
  - Any applications other than the standard applications intended.
- (4) The products and product specifications described in this material are subject to change without notice for reasons of modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.
- (5) When designing your equipment, comply with the guaranteed values, in particular those of maximum rating, the range of operating power supply voltage and heat radiation characteristics. Otherwise, we will not be liable for any defect which may arise later in your equipment.  
Even when the products are used within the guaranteed values, redundant design is recommended, so that such equipment may not violate relevant laws or regulations because of the function of our products.
- (6) When using products for which dry packing is required, observe the conditions (including shelf life and after-unpacking standby time) agreed upon when specification sheets are individually exchanged.
- (7) No part of this material may be reprinted or reproduced by any means without written permission from our company.

## Please read the following notes before using the datasheets

- A. These materials are intended as a reference to assist customers with the selection of Panasonic semiconductor products best suited to their applications.  
Due to modification or other reasons, any information contained in this material, such as available product types, technical data, and so on, is subject to change without notice.  
Customers are advised to contact our semiconductor sales office and obtain the latest information before starting precise technical research and/or purchasing activities.
- B. Panasonic is endeavoring to continually improve the quality and reliability of these materials but there is always the possibility that further rectifications will be required in the future. Therefore, Panasonic will not assume any liability for any damages arising from any errors etc. that may appear in this material.
- C. These materials are solely intended for a customer's individual use.  
Therefore, without the prior written approval of Panasonic, any other use such as reproducing, selling, or distributing this material to a third party, via the Internet or in any other way, is prohibited.



LittleDiode supplies new, hard to find or obsolete electronic components and semiconductors all over the world.

With over two million different components listed you are sure to find the part you need.

Feel free to visit us today at our online store:

[LittleDiode.com](http://LittleDiode.com)

Looking forward to providing you with the best possible service.