

AN7298FBP

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

■ Overview

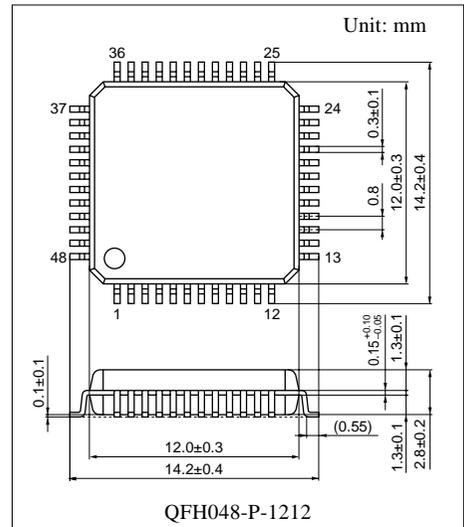
The AN7298FBP is an IC for car radio. The FM-IF, NC (Noise Canceler) and MPX functions are integrated into a single chip. The IC has the higher functions than our conventional IC (AN7292NSC) and the characteristics of multi-pass detection, mute and SD functions are improved.

■ Features

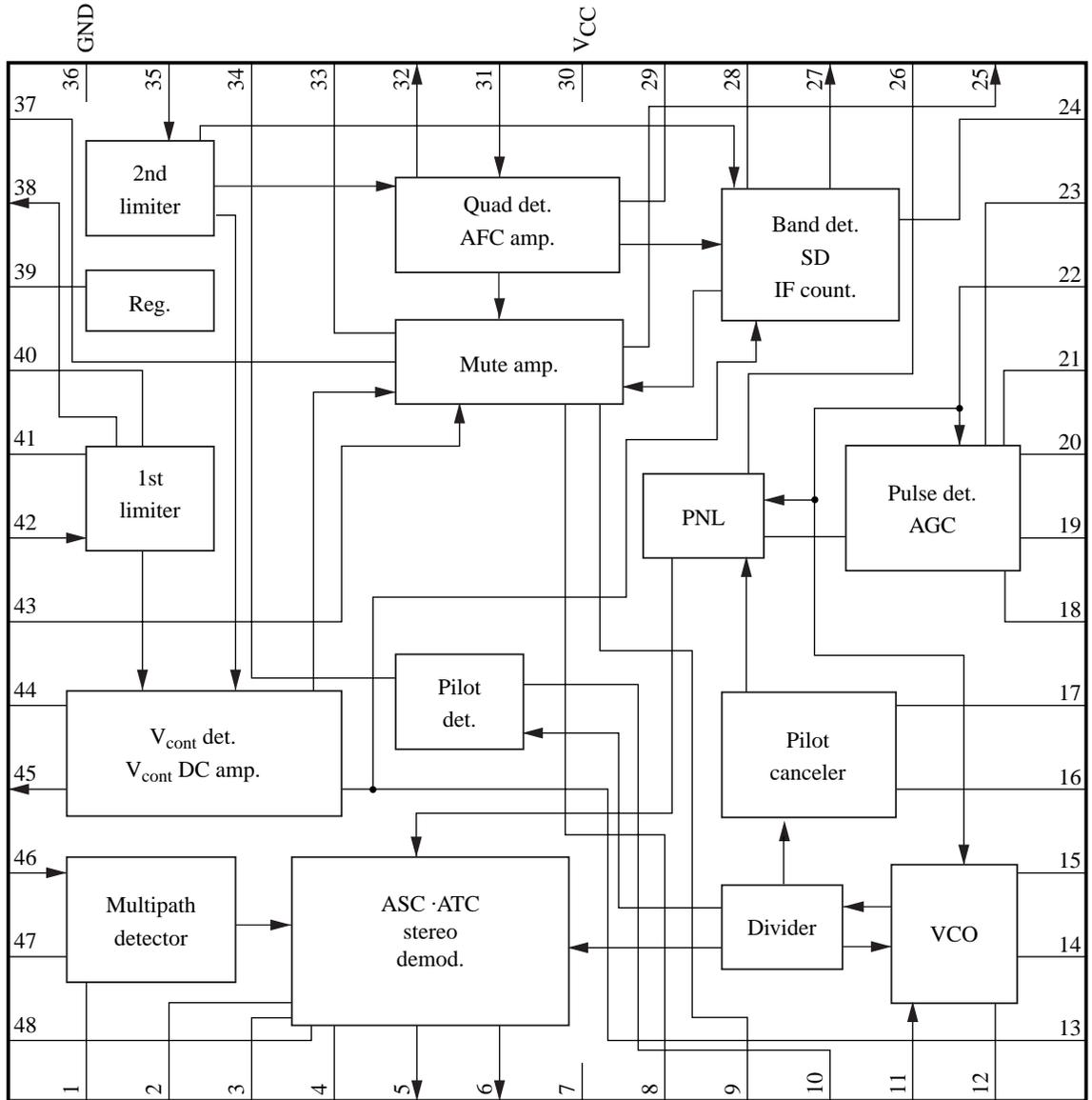
- IF sensitivity is high. (limiting sensitivity 26 dB μ)
- Adjustment-free VCO (912 kHz)
- Good linearity of S-meter output (adjusting function)

■ Applications

- Car radios



■ 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 $V_{CC} = 8\text{ V}$, $f_{IN} = 10.70\text{ MHz}$, $f_{mod} = 1\text{ kHz}$ 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 μ
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 _{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	$V_{IN} = 70\text{ dB}\mu$, L+R = 90% Pilot 10%	25	33	—	dB
Separation R-ch.	Sep _R	$V_{IN} = 70\text{ dB}\mu$, 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 _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 $V_{CC} = 8\text{ V}$, $f_{IN} = 10.70\text{ MHz}$, $f_{mod} = 1\text{ kHz}$ 30%FM, $T_a = 25^\circ\text{C}$ (continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Stereo THD (L-ch.)	THD _{SL}	Stereo, L+R = 360 mV, $V_p = 40\text{ mV}$, L-ch. distortion	—	0.15	0.3	%
Stereo THD (R-ch.)	THD _{SR}	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	μs
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 μ

■ Application Circuit Example

