

# AN7289NFBQ

## FM-FE+AM IC for car radio

### Overview

The AN7289NFBQ is an IC having FM-FE+AM functions for car radio. A tuner block of car radio can be constructed by using this IC and the AN7293NSC/NFBQ.

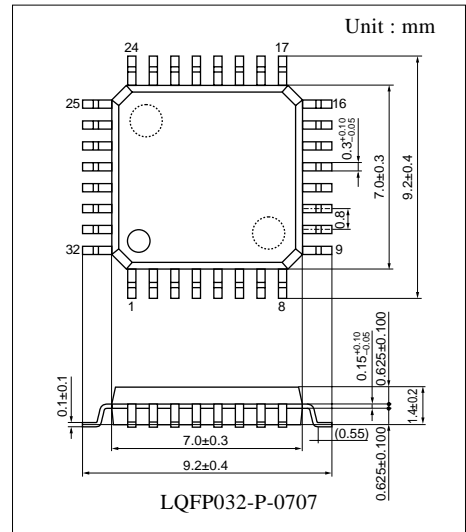
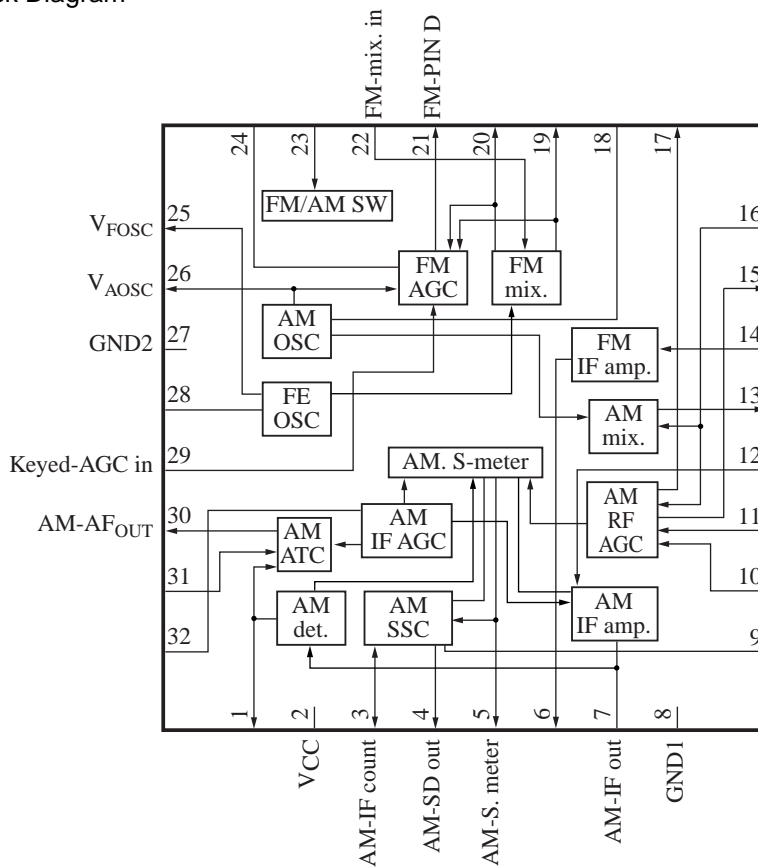
### Features

- A less number of electrolytic capacitors is required (3 capacitors reduction compared with our conventional IC)
- AM: Effective sensitivity is improved by 2 dB through ATC
- AM: Strong-input characteristic is improved by 2-loop-AGC function
- The AN7289NSC of DIL package type is also available

### Applications

- Car radios

### Block Diagram



### ■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	AM detection output	17	FM-PIN diode driver
2	V <sub>CC1</sub>	18	AM-OSC coil pin
3	AM-IF counter output/DX/LO SW	19	FM-mix. output 2
4	AM-SD output	20	FM-mix. output 1
5	AM-signal meter output	21	FM-PIN diode driver
6	FM-IF output	22	FM-mix. input
7	AM-IF output	23	V <sub>CC2</sub> /FM/AM SW
8	GND1	24	FM-AGC output
9	SSC	25	FM-OSC buffer output
10	AM-RF level detection	26	AM-OSC buffer output/FE-AGC sensitivity setting
11	AM-WAGC detection/DX setting	27	GND2
12	AM-IF input	28	FM-OSC coil pin
13	AM-mix. output	29	FM-keyed-AGC input
14	FM-IF input	30	AM-AM output/LO setting
15	AM-RF gain control	31	AM-ATC input
16	AM-mix. input	32	AM-IF level detection

### ■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage	V <sub>CC</sub>	9.1	V
Supply current	I <sub>CC</sub>	56	mA
Power dissipation *2	P <sub>D</sub>	343.3	mW
Operating ambient temperature *1	T <sub>opr</sub>	-35 to +80	°C
Storage temperature *1	T <sub>stg</sub>	-55 to +125	°C

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

\*2: Referring to "■ Technical Information" for power dissipation at T<sub>a</sub> = 80°C, use the circuit under the conditions not exceeding the allowable limit value.

### ■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V <sub>CC</sub>	7.2 to 9.0	V

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

• AM mode at  $V_{CC} = 8.0\text{ V}$ ,  $f_{IN2} = 1\text{ MHz}$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
AM consumption current 1	amL <sub>T1</sub>	Without input	28	36	44	mA
AM consumption current 2	amL <sub>T2</sub>	$f_{IN2} = 1\text{ MHz}$ , $V_{IN2} = 130\text{ dB}\mu$	33	41	49	mA
AM-AF output	amV <sub>O</sub>	$V_{IN2} = 74\text{ dB}\mu$ , 400 Hz 30%, AM-AF output	105	135	160	mV
AM signal-to-noise ratio	amSN	$V_{IN2} = 74\text{ dB}\mu$ , 400 Hz 30%, AM-AF output S/N	48	52	58	dB
AM-AGC width	amW	$V_{IN2} = 74\text{ dB}\mu$ , 400 Hz 30%, AM-AF output -10 dB input change	56	60	64	dB
AM-ATC operation	amATC	(Output ratio [dB] of 400 Hz and 3 kHz when $V_{IN2} = 18\text{ dB}\mu$ ) - (output ratio [dB] of 400 Hz and 3 kHz when $V_{IN2}$ = 74 dB $\mu$ ) 80%Mod., AM-AF <sub>OUT</sub> output	3.5	6.5	9.5	dB
AM-distortion rate 1	amT1	$V_{IN2} = 74\text{ dB}\mu$ , 400 Hz 80%, AM-AF output distortion	0.01	0.5	1.5	%
AM-distortion rate 2	amT2	$V_{IN2} = 130\text{ dB}\mu$ , 400 Hz 80%, AM-AF output distortion	0.01	0.5	1.5	%
AM wide band AGC on input	amV <sub>W</sub>	$f_{IN2} = 1.4\text{ MHz}$ , input when pin 15 voltage becomes below 3 V	96	102	108	dB $\mu$
AM local oscillation buffer output	amV <sub>OS</sub>	Without input	160	210	260	mV
AM-IF count output 1	amIF1	$V_{IN2} = 40\text{ dB}\mu$	150	210	270	mV
AM-IF count output 2	amIF2	Without input	—	—	10	mV
AM-SD output 1	amSD1	$V_{IN2} = 40\text{ dB}\mu$	4.5	4.9	5.1	V
AM-SD output 2	amSD2	Without input	0.0	0.2	0.5	V
AM signal meter output 1	amV <sub>S1</sub>	Without input, pin 5 voltage	1	50	200	mV
AM signal meter output 2	amV <sub>S2</sub>	$V_{IN2} = 30\text{ dB}\mu$ , pin 5 voltage	0.8	1.05	1.3	V
AM signal meter output 3	amV <sub>S3</sub>	$V_{IN2} = 130\text{ dB}\mu$ , pin 5 voltage	4.1	4.8	5.1	V
AM search sensitivity DX	amDX	AM-IF count output is over 120 mV $V_{IN2}$ when f becomes 450 kHz $\pm$ 2 kHz	23	29	35	dB $\mu$
AM search sensitivity LO	amLO	AM-IF count output is over 120 mV $V_{IN2}$ when f becomes 450 kHz $\pm$ 2 kHz	43	49	55	dB $\mu$

Note) FM tuning condition: Adjust  $V_{ATU}$  voltage so that  $V_{AOSC}$  output frequency becomes 1 450 kHz $\pm$ 500 Hz

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

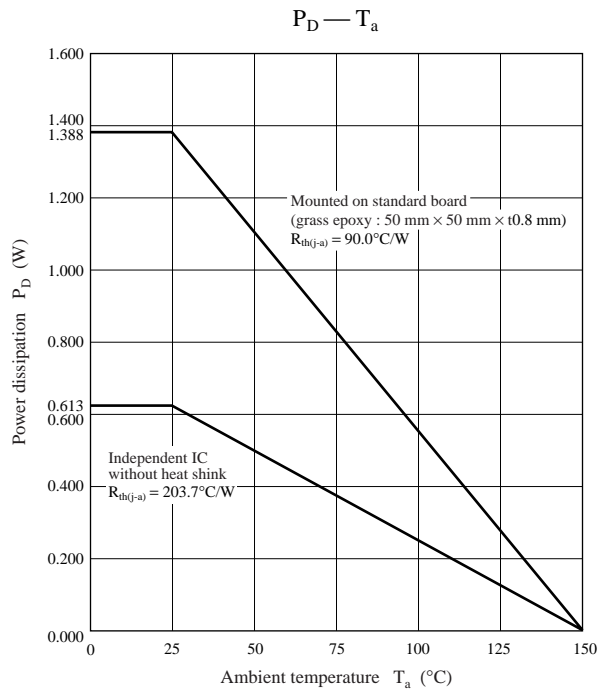
- FM mode at  $V_{CC} = 8.0\text{ V}$ ,  $f_{IN1} = 98\text{ MHz}$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
FM local oscillation buffer output	fmV <sub>OS</sub>	$f_{OSC} = 108.7\text{ MHz}$ , without input	140	200	260	mV
FM-IF output level	fmIF	$V_{IN1} = 71\text{ dB}\mu$	40	75	110	mV
FM-AGC sensitivity	fmAGC	$V_{IN1}$ level when $V_{24}$ becomes 3 V	60	64	68	dB $\mu$
High-level FM-AGC voltage	fmV <sub>AH</sub>	$V_{IN1} = 70\text{ dB}\mu$	6.0	6.4	6.8	V
Low-level FM-AGC voltage	fmV <sub>AL</sub>	$V_{IN1} = 82\text{ dB}\mu$	—	0.05	0.5	V
FM consumption current	fmI <sub>T</sub>	Without input	26	35	44	mA

Note) FM tuning condition: Adjust  $V_{FTU}$  voltage so that  $V_{FOSC}$  output frequency becomes  $108.7\text{ MHz} \pm 10\text{ kHz}$ .

### ■ Technical Information

- $P_D$  —  $T_a$  curves of LQFP032-P-0707



■ Application Circuit Example

