

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.

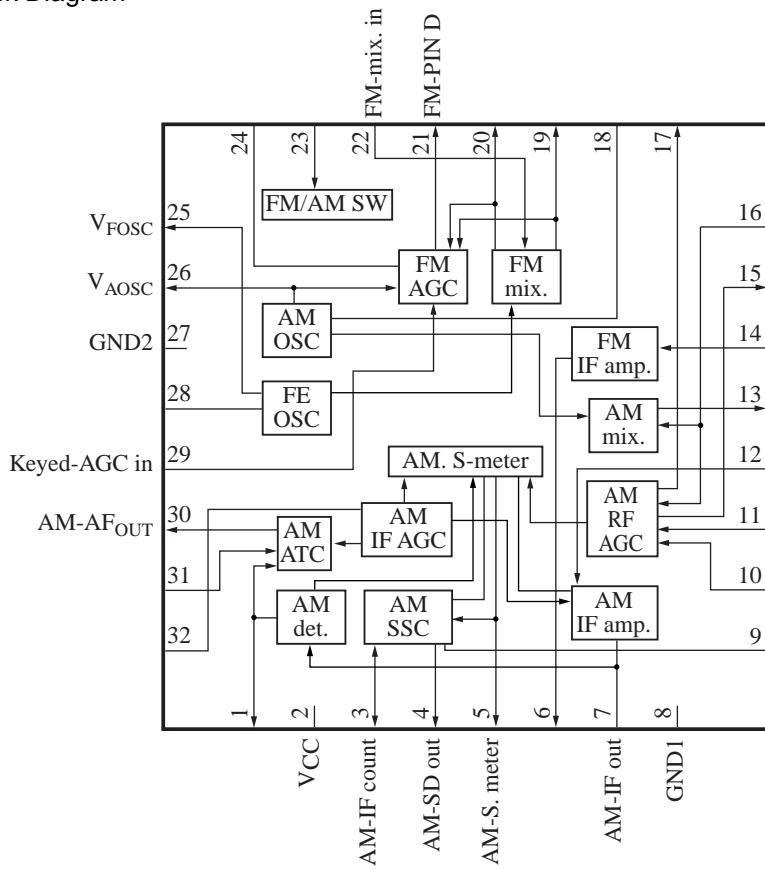
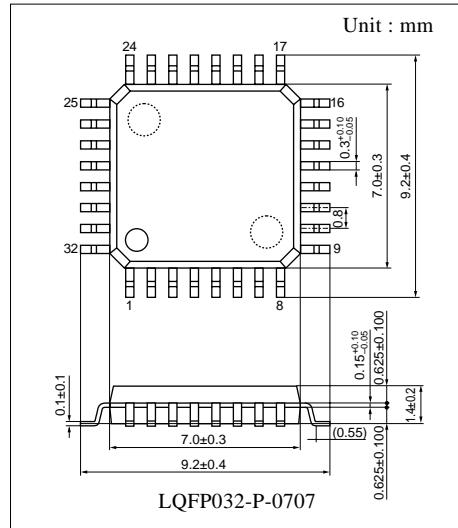
■ Features

- 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_{CC1}	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_{CC2} /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_{CC}	9.1	V
Supply current	I_{CC}	56	mA
Power dissipation ^{*2}	P_D	343.3	mW
Operating ambient temperature ^{*1}	T_{opr}	-35 to +80	°C
Storage temperature ^{*1}	T_{stg}	-55 to +125	°C

Note) *1: $T_a = 25^\circ\text{C}$ except power dissipation, operating ambient temperature and storage temperature.

*2: Referring to "■ Technical Information" for power dissipation at $T_a = 80^\circ\text{C}$, use the circuit under the conditions not exceeding the allowable limit value.

■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V_{CC}	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 _{T1}	Without input	28	36	44	mA
AM consumption current 2	amL _{T2}	$V_{IN2} = 1\text{ MHz}$, $V_{IN2} = 130\text{ dB}\mu$	33	41	49	mA
AM-AF output	amV _O	$V_{IN2} = 74\text{ dB}\mu$, 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 $V_{IN2} = 74\text{ dB}\mu$) 80%Mod., AM-AF _{OUT} 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 _W	$f_{IN2} = 1.4\text{ MHz}$, input when pin 15 voltage becomes below 3 V	96	102	108	$\text{dB}\mu$
AM local oscillation buffer output	amV _{OS}	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 _{S1}	Without input, pin 5 voltage	1	50	200	mV
AM signal meter output 2	amV _{S2}	$V_{IN2} = 30\text{ dB}\mu$, pin 5 voltage	0.8	1.05	1.3	V
AM signal meter output 3	amV _{S3}	$V_{IN2} = 130\text{ dB}\mu$, 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 $450\text{ kHz} \pm 2\text{ kHz}$	23	29	35	$\text{dB}\mu$
AM search sensitivity LO	amLO	AM-IF count output is over 120 mV V_{IN2} when f becomes $450\text{ kHz} \pm 2\text{ kHz}$	43	49	55	$\text{dB}\mu$

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

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

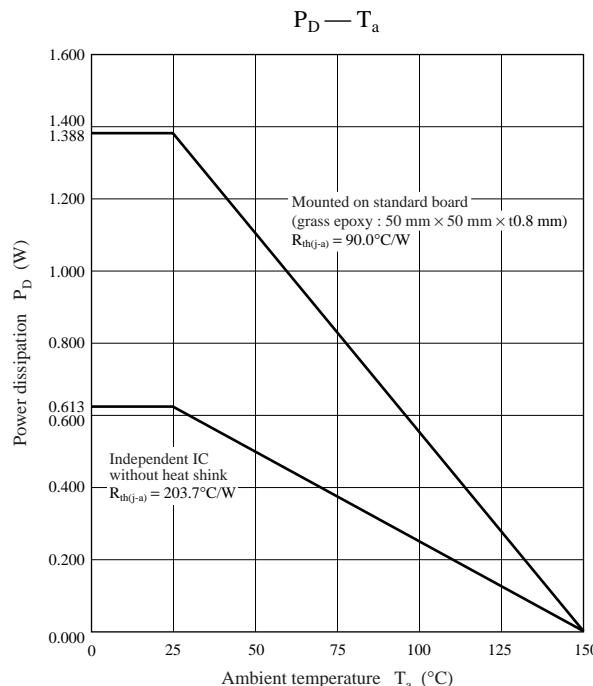
- FM mode at $V_{\text{CC}} = 8.0 \text{ V}$, $f_{\text{IN1}} = 98 \text{ MHz}$

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

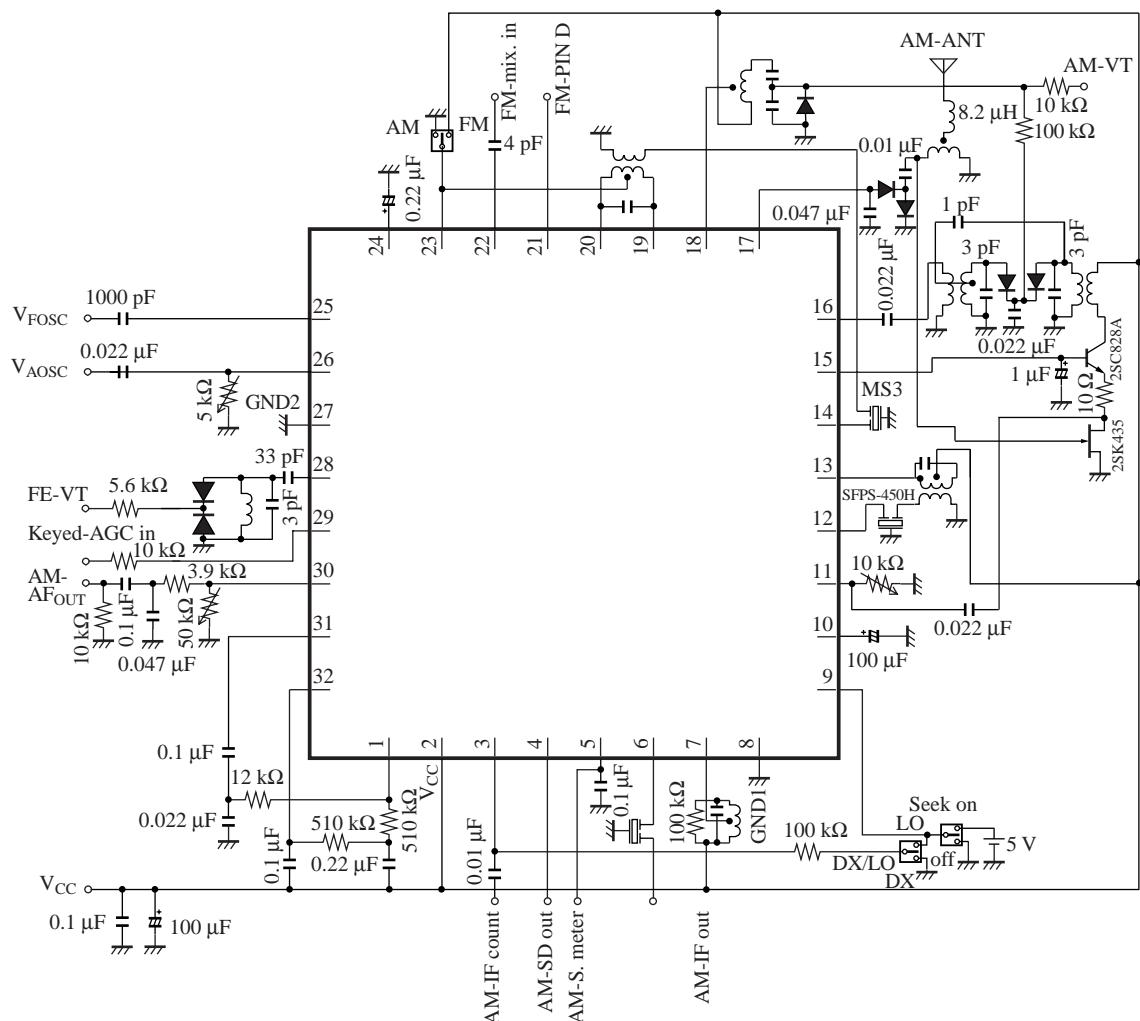
Note) FM tuning condition: Adjust V_{FTU} voltage so that V_{FOSC} output frequency becomes $108.7 \text{ MHz} \pm 10 \text{ kHz}$.

■ Technical Information

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



■ Application Circuit Example



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.