

ICs for FM/AM Tuner

Panasonic

AN7259S

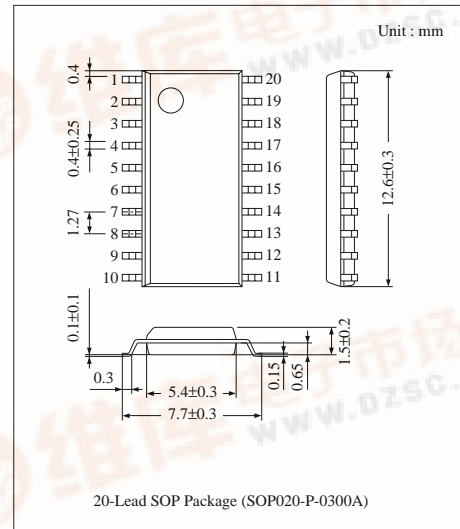
FM-IF Amplifier Circuit for Car Radio

■ Overview

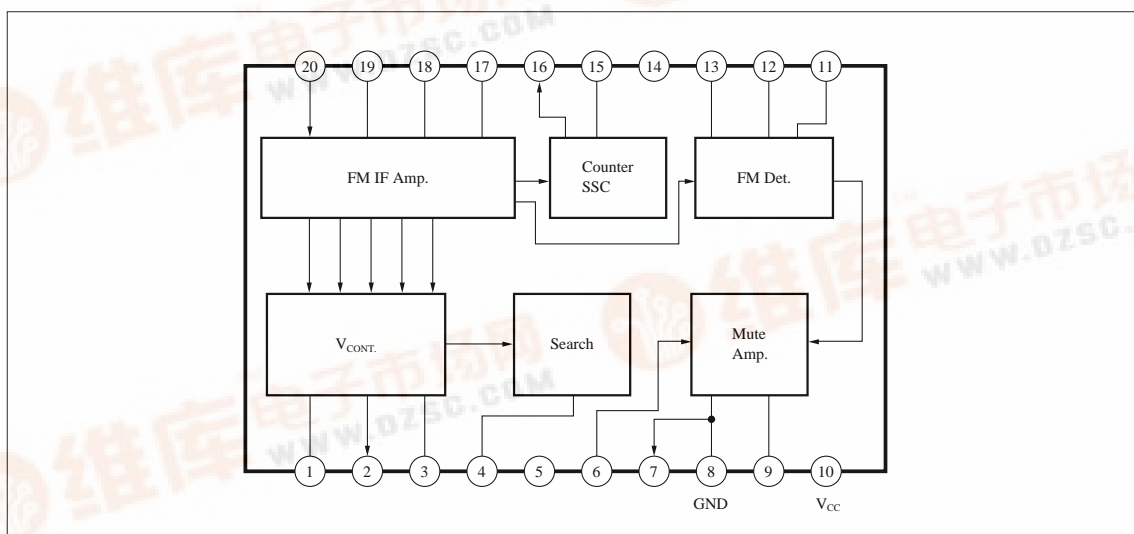
The AN7259S is an FM-IF/DET IC for car radio/car stereo and has each function necessary for electronic-tuner.

■ Features

- Quadrature detection system and fewer external parts
- Good linearity of control voltage output used for AGC and separation control, etc.
- IF counter output and search output in channel selection signal as electronic tuning and with IF counter output ON/OFF circuit (SSC)
- Adjustment of search band width and search output center frequency
- Soft muting adjusting function



■ Block Diagram



■ Absolute Maximum Ratings (Ta=25°C)

| Parameter | Symbol | Rating | Unit |
|-------------------------------|------------------|-------------|------|
| Supply Voltage | V _{CC} | 9.6 | V |
| Supply Current | I _{CC} | 23 | mA |
| Power Dissipation (Ta = 75°C) | P _D | 230 | mW |
| Operating Ambient Temperature | T _{opr} | -30 ~ + 75 | °C |
| Storage Temperature | T _{stg} | -55 ~ + 125 | °C |

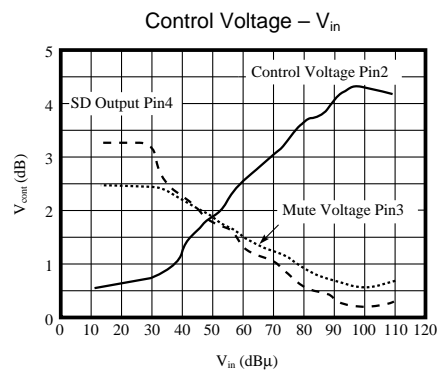
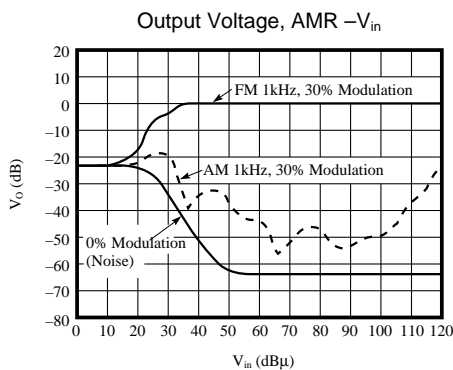
■ Recommended Operating Range (Ta=25°C)

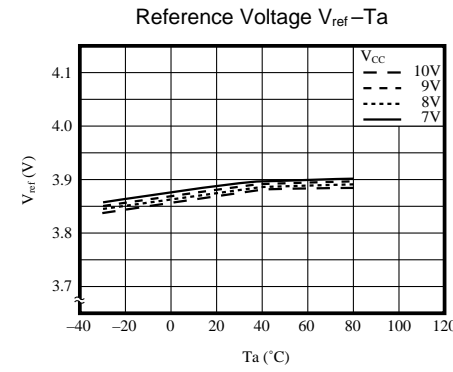
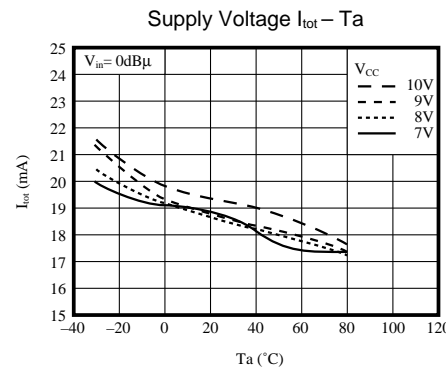
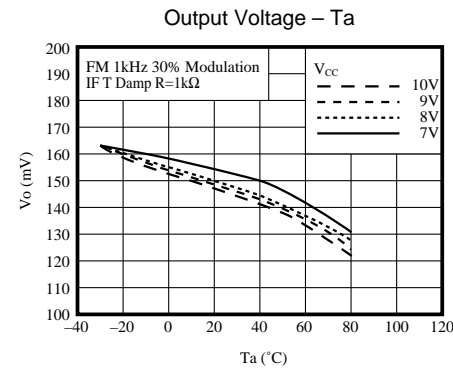
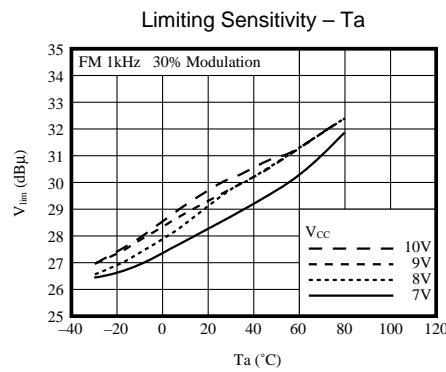
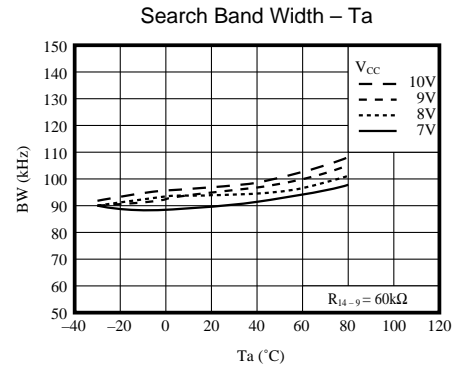
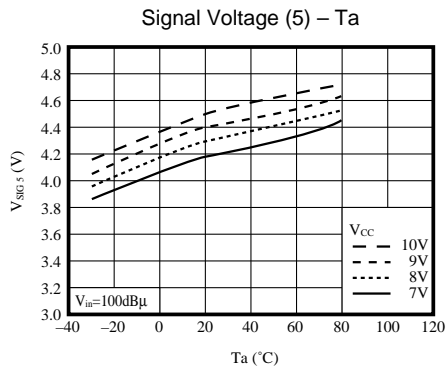
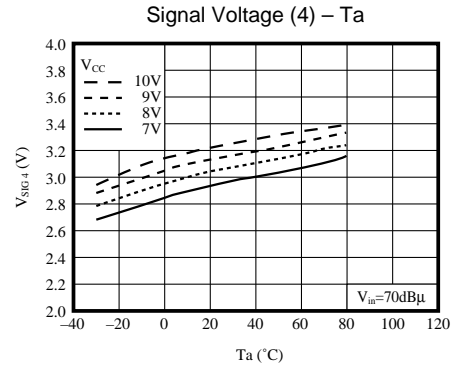
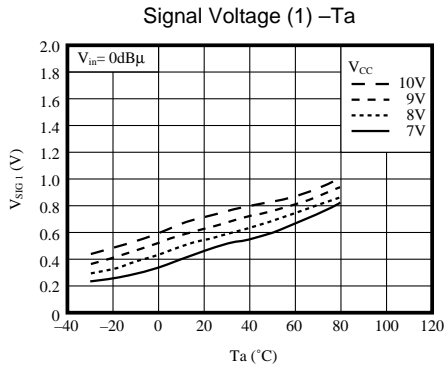
| Parameter | Symbol | Range |
|--------------------------------|-----------------|-------------|
| Operating Supply Voltage Range | V _{CC} | 7.3V ~ 9.6V |

■ Electrical Characteristics (V_{CC} = 8V, FM 1kHz 30% Modulation, Ta= 25°C)

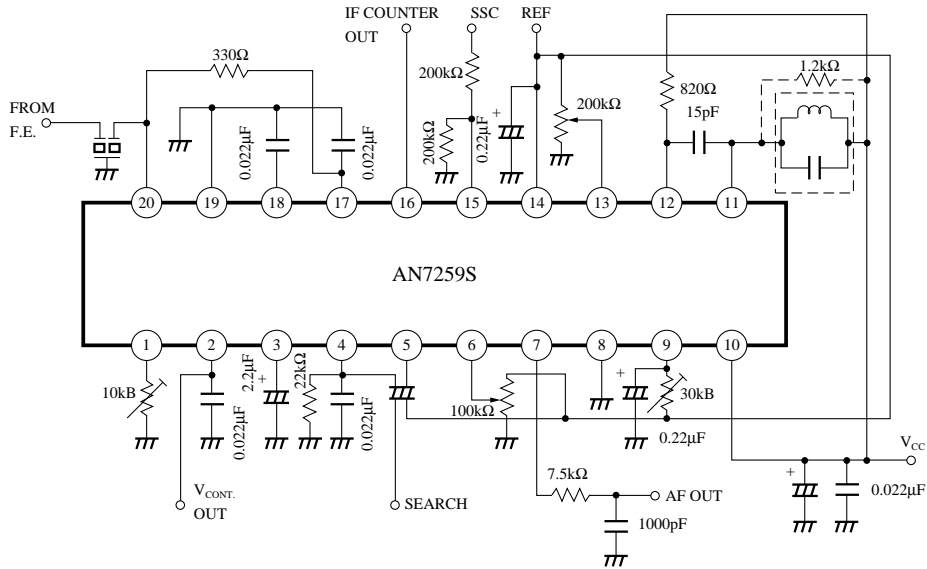
| Parameter | Symbol | Condition | min. | typ. | max. | Unit |
|---------------------------------|---------------------|---|------|------|------|-------|
| Limiting Sensitivity | V _{lim} | Input at V _O = -3dB | 26.5 | 29.5 | 32.5 | dBμ |
| Detection Output Level | V _O | V _{in} = 70dBμ | 150 | 175 | 210 | mVrms |
| AFC Offset Voltage | V _{offset} | V _{in} = 0dBμ, Pin9 -14 voltage | -240 | 0 | 240 | mV |
| Signal Voltage (1) | V _{SIG1} | V _{in} = 0dBμ, Pin2 voltage | 0.19 | 0.52 | 0.85 | V |
| Signal Voltage (2) | V _{SIG2} | V _{SIG4} - V _{SIG1} | 2.51 | 2.92 | 3.33 | V |
| Signal Voltage (3) | V _{SIG3} | V _{SIG5} - V _{SIG4} | 1.15 | 1.45 | 1.75 | V |
| Signal Voltage (4) | V _{SIG4} | V _{in} = 70dBμ, Pin2 voltage | 2.92 | 3.4 | 3.98 | V |
| Signal Voltage (5) | V _{SIG5} | V _{in} = 100dBμ, Pin2 voltage | 4.11 | 4.8 | 5.56 | V |
| Search Signal Band Width | BW | Band width at Pin4 DC voltage = 2.5V, R = 30kΩ | 145 | 165 | 185 | kHz |
| Supply Current | I _{tot} | V _{in} = 0dBμ | 15 | 19 | 23 | mA |
| THD | | Mod. = 30%, V _{in} = 100dBμ | — | 0.1 | — | % |
| THD | | Mod. = 100%, V _{in} = 100dBμ | — | 0.3 | — | % |
| S/N | | Mod. = 30%, V _{in} = 100dBμ | — | 63 | — | dB |
| IF Counter Output Level | | Pin16, 10.7MHz Output | — | 250 | — | mVrms |
| AMR | | AM = 30% Mod., FM = 30% Mod. | — | 50 | — | dB |
| Residual Noise Level | | V _{in} = 0dBμ | — | -23 | — | dB |
| Control Voltage Adjusting Width | | Referred to Input | 30 | — | — | dB |
| Reference Voltage | | | — | 3.9 | — | V |
| AF Output Impedance | | | — | 300 | — | Ω |

■ Characteristics Curve





■ Application Circuit



■ Pin Descriptions

• Control Signal Output Block

The AN7259S has linear level meter output (control voltage on Pin2) whose dynamic range is about 60dB wider for change of the input. This control voltage is adjustable by the resistor R_4 of Pin1. The adjustable range at $R_4 = 0.8k\Omega \sim 10k\Omega$ is more than 30dB in conversion of the input.

The polarity of the output voltage from Pin3 is reverse to that of the voltage to be output from Pin2. This output from Pin3 requires insertion of a capacitor ($C_5 = 4.7\mu F$) since it is used for soft muting. The search output (right sketch) to be used for channel selection is obtainable on Pin4. The band width of this search output is adjustable. (Refer to Detection Block.)

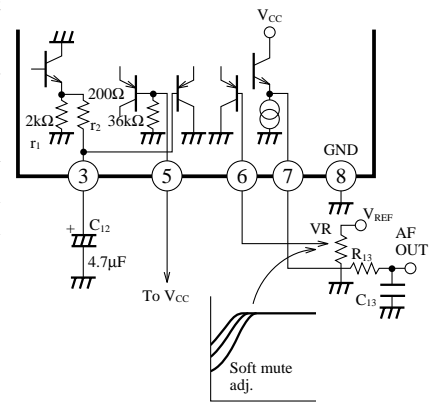
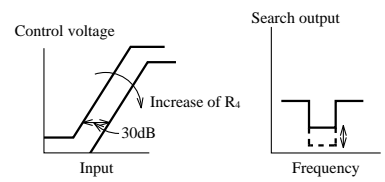
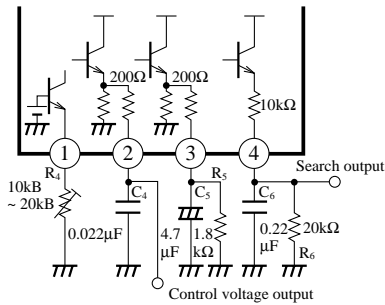
The search stop sensitivity is externally adjustable because the L level value varies with the input signal level.

• Soft Mute

Pin7 is the AF output pin, and the emitter follower output of $\approx 300\Omega$ in output impedance is obtainable on this pin.

Pin6 is the soft mute adjusting pin to adjust the attenuation at the non-input mode.

Soft mute here denotes muting by the level signal output from Pin3, and the soft mute response varies with the time constant of this voltage output. The r_2 and C_{12} are related to the weak input S/N and the soft mute ON time, and with increase of the C_{12} value, the weak input S/N is proportionately improved, but the speed of response accordingly becomes lower. The r_1 , on the other hand, is related to the soft mute OFF time. Each value specified in the right sketch denotes a recommended value.



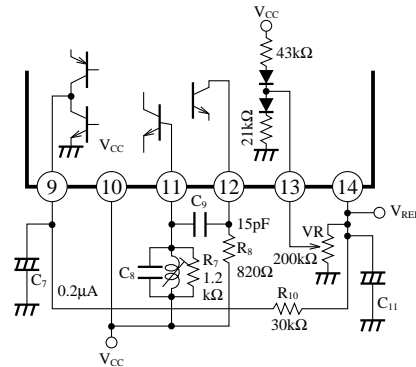
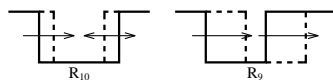
• Detection Block

Pin11 and Pin12 constitutes a phase-shifting circuit of the QUAD detector by external circuit. The R_7 is a coil damp resistor, and it exerts influences on the noise, THD, and output level.

Its recommended value is $1.2k\Omega \sim 1.8k\Omega$.

Pin9 is the AFC voltage output pin, and according to the value of R_{10} , the band width of the Pin4 search output can be adjusted.

Pin13 is the center frequency adjusting pin of the Pin4 search output, and makes it possible to adjust the center frequency of the search output independently of the coil.



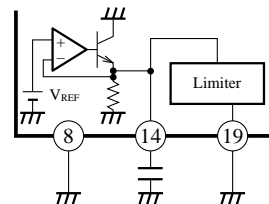
*An Example of Coil Adjusting Method

| | |
|---|--|
| In case of channel selection by IF counter output | Adjust the coil so that the $V(9, 14)$ at $V_{in}=0dB\mu$ becomes equal to $V(9, 14)$ at $V_{in}=100dB\mu$. |
| In case of channel selection by search output | Same as above. Thereafter, adjust the center frequency of the search output by the Pin13 VR. |

$V(9, 14)$... DC voltage between Pin9 and Pin14
 V_{in} ... Level of IF input Pin20

• Reference Voltage (V_{REF})

The reference voltage (3.9V) is output from Pin14. Remember to bypass it by an external capacitor since this line is used as the power supply line to the limiter.

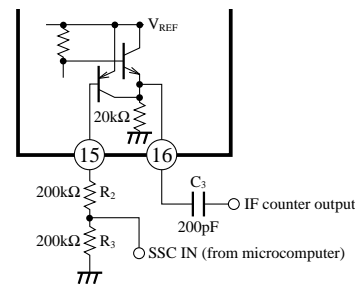


• IF Counter Output SSC

Pin16 is the IF counter output pin, and the output of about $300mV_{P-P}$ is obtainable on this pin. Because of its high gain, the IF counter output line is separated on the pattern from the Pin20 (IF input) line in order to avoid oscillation trouble.

Pin15 is the SSC pin to stop the IF counter, and according to the V_{SSC} level, the IF counter operation changes as shown in the table below. The H level must be 4.2V or higher, and the L level must be 1V or lower. SSC is used for prevention of the bad influences of the IF counter output on the other blocks in the receiving mode.

| V_{SSC} | H | L |
|------------|----|------|
| IF counter | ON | STOP |



• IF Input Block

Pin20 is the IF input pin, and the input impedance is set between this pin and Pin17 by R_1 . Usually a resistor of 330Ω is used as R_1 to secure optimum matching with CF.

Pin17 and Pin18 are the internal DC feedback pins, and the high frequency components are bypassed through C_1 and C_2 .

Pin19 is the GND pin dedicated to the limiter, and each GND of CF, C_2 and C_1 must be set close to Pin19. Externally short the GND of Pin19 with the GND of Pin8.

