WPM 14.6

A Complete Single Chip AM Stereo / FM Stereo Radio IC

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ABSTRACT

For the first time in the world , a complete single chip AM stereo / FM stereo radio IC which can be used for the portable radio has been developed. The PLL circuit for the pilot detection make it stable to receive AM stereo.

INTRODUCTION

In Japan , almost every radio set has begun to apply AM stereo function. But the system has become complex , and the performances are not satisfactory at this moment. To achieve high performance of this application , high C/N oscillator , less phase and level error of the IF signal, and high reliability on the pilot detection are required. For this purpose, a complete single chip LSI for AM stereo / FM stereo radio has been developed.

The Configuration of the AM Stereo / FM Stereo Radio

Fig1. is a block diagram of the new LSI. Most of the circuit are integrated : FM front end, FM IF limiter amplifier , FM stereo decoder , AM front end, AM IF amplifier, PLL for AM stereo detection , and PLL for AM stereo pilot detection. The capture range of the PLL in I/Q detector is about ±4KHz, but the loop-gain-controlled PLL can improve the selectivity and adjacent frequency interference characteristic and generate pure carrier for the detector. To improve the reliability of the pilot detection, the AM stereo detection circuit is controlled by the " AND logic" of the two lock detection circuit , IF PLL and PLL for the pilot signal. FM DISCRI has DC cancellation circuit for dc offset from the FM S-curve to keep the dynamic range of the audio block at low voltage. This LSI can operate on Vcc 2~12, and is encased in the low profile quad flat L-leaded package (LQFP).

The New PLL Circuit for AM Stereo Detection

PLL circuit for the synchronous detector has been designed to achieve a high C/N ratio of the regenerated carrier to obtain a high S/N ratio on AM stereo reception. By calculation , side band noise level of the carrier needs more than 79dB (at 10Hz bandwidth) to get over S/N 40dB (m=0.3). The new PLL circuit has almost the same capture range as lock range. After PLL locks, loop gain is reduced to 1/100. As a result, interference caused by the strong undesired signal is reduced and the purity of the regenerated carrier has been improved.

The PLL Circuit for AM Stereo Pilot Detection

In detecting the pilot signal on Sub-ch , PLL circuit has a big advantage on reliability and stability compared with the conventional one. The 2nd ordered BPF is useful to separate the pilot signal from the audio signal on Q detector. The PLL for the pilot detects the level of the pilot and indicates the existence of the stereo service after the lock up of IF PLL.

Both PLL have a lock detector with hysteresis to improve the stability of the AM stereo reception at fringe area or excessive field strength change on mobile reception.

CONCLUSION

A complete single chip radio LSI that includes AM stereo and FM stereo function has been developed.

An automatic identification logic by the two PLL has improved reliability of the pilot detection , and the new LSI has realized high quality reception on AM stereo.

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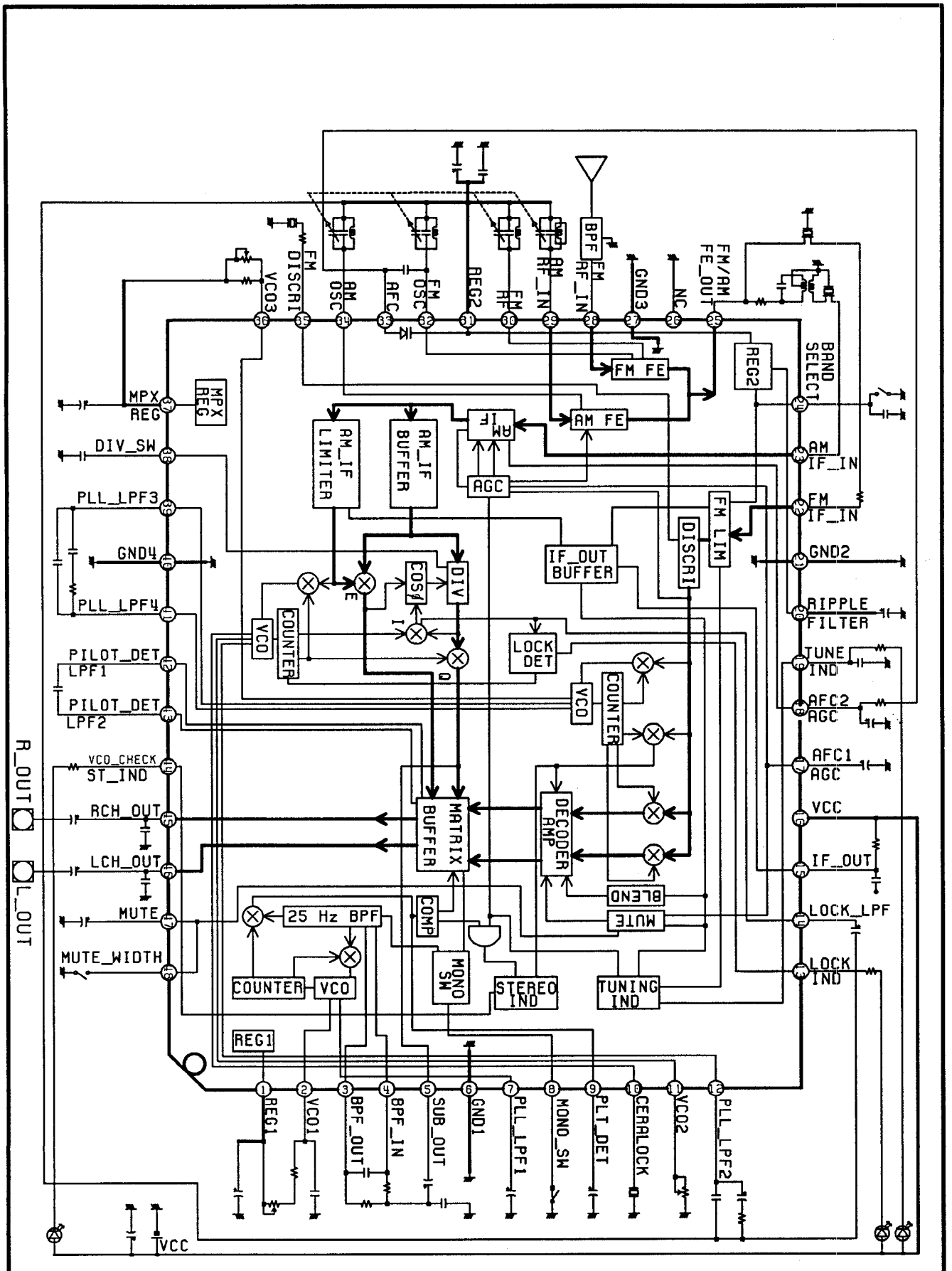

Fig.1 Block Diagram of new LSI