



NXP FM-RDS/TMC background receivers TEF7006 & TEF7007

High-performance FM car radio receivers for background scanning

These advanced devices, which are able to decode data from RDS, RBDS, and TMC services, can also be used as equivalent receivers for background station list updates.

Key features

- ▶ Compact, highly integrated, and pin-compatible devices
- ▶ Lowest total system cost when combined with other NXP offerings
 - Low-IF DSP family SAF774x
 - High-efficiency, one-chip radio family TEF663x
- ▶ Support standalone operating mode with quartz crystal
- ▶ Fast-mode I²C bus (400 kHz)
- ▶ Single 5 V supply voltage
- ▶ AEC-Q100 qualified
- ▶ HVQFN32 package (5 x 5 x 0.85 mm, 0.5 mm pitch)

The NXP TEF7006 and TEF7007 deliver automotive-qualified performance while enabling compact, low-cost implementation of FM-RDS background receivers. They perform all the radio and audio functions, building on NXP's market-leading technologies for low-IF tuners and digital low-IF car DSPs, and digitally processed RDS demodulation and decoding based on NXP's proven technology. The TEF7007 adds an integrated FM antenna buffer, to simplify the development of systems that require

buffering. Both devices are completely adjustment-free and require only a small number of external components. The very high level of integration makes it easy to obtain a very compact design.

The FM receivers in both devices cover the Japan/EU/USA bands from 76 to 108 MHz and are able to decode data from Radio Data System (RDS), Radio Broadcast Data System (RBDS), and Traffic Message Channel (TMC) services. DARC/VICS decoders are supported as well, via the MPX output. Excellent tuner characteristics, along with the ability to detect all relevant weak signal conditions, make it possible to use these devices as equivalent receivers for background station list generation and updates.

The devices can be used in combination with NXP's digital low-IF car DSP systems (TEF7000 & SAF774x) for car radio/audio applications. They can interface to the car DSP clock reference, or can use a crystal oscillator operating at 16 MHz. The reception quality and performance are similar to that of the main tuner, and therefore optimized for



background receiver functions. Both devices can also operate as standalone TMC receivers in navigation units or in Traffic Information Message (TIM) recording applications.

Both devices use an on-chip, highly linear and AGC-controlled FM LNA and mixer for best image rejection. In combination with a fast PLL tuning system, which controls a fully integrated low-phase-noise VCO, the desired FM signal is converted to a complex 250 kHz IF. To optimize reception quality, the low- or high-side injection mode of the local oscillator (LO) is automatically selected. Each device also uses integrated IF filtering, with a four-step switchable IF filter bandwidth function, to achieve optimal FM demodulation. The I²C bus provides and reads the following detectors: field strength/ RSSI (LEVEL), multipath (WAM - Wideband AM), noise (USN - UltraSonic Noise), and IF counter information (IFCOUNT).

The TEF7006 and TEF7007 generate a MultiPlex (MPX) output signal, followed by a digitally realized RDS demodulation and decoding block. The MPX output also supports Data Radio Channel (DARC) formats, including Vehicle Information and Communication System (VICS) decoders. A mono audio signal with an integrated bandwidth filter is available at an analog

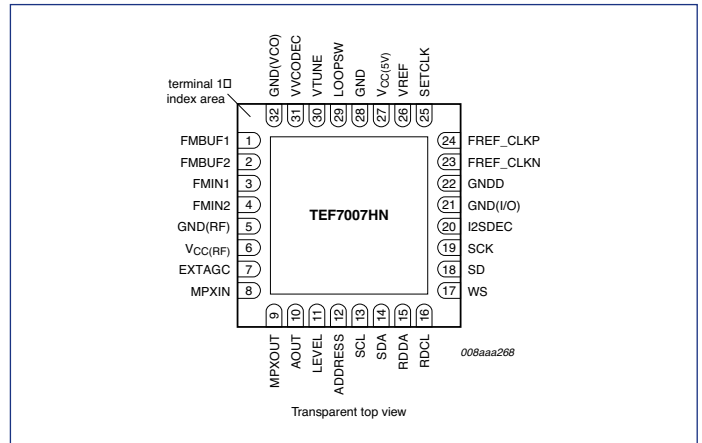
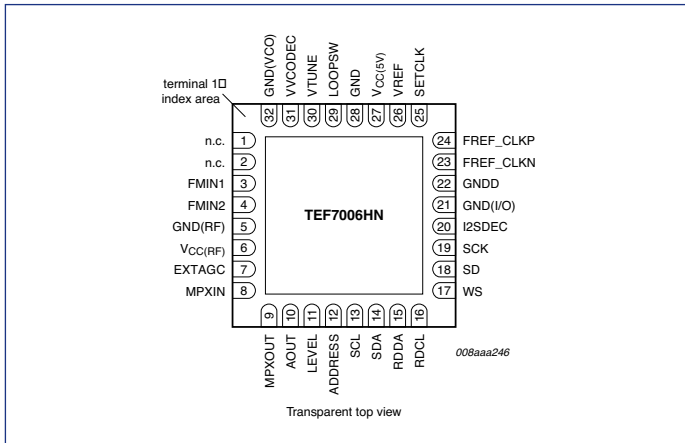
output, and also at digital I²S-bus audio interface. That way, both interfaces can support either TIM recording devices that use analog or digital inputs.

Superior RDS sensitivity is achieved by optimized digital filtering and signal processing. The RDS decoder includes a memory for two data blocks, and provides fast block synchronization and error detection. The RDS data blocks and status info can be read via the I²C-bus. Hardware pins are provided for the RDS data-available interrupt flag (DAV_N), and the RDS clock and demodulator data stream outputs RDCL and RDDA. These pins can alternatively be used as software ports.

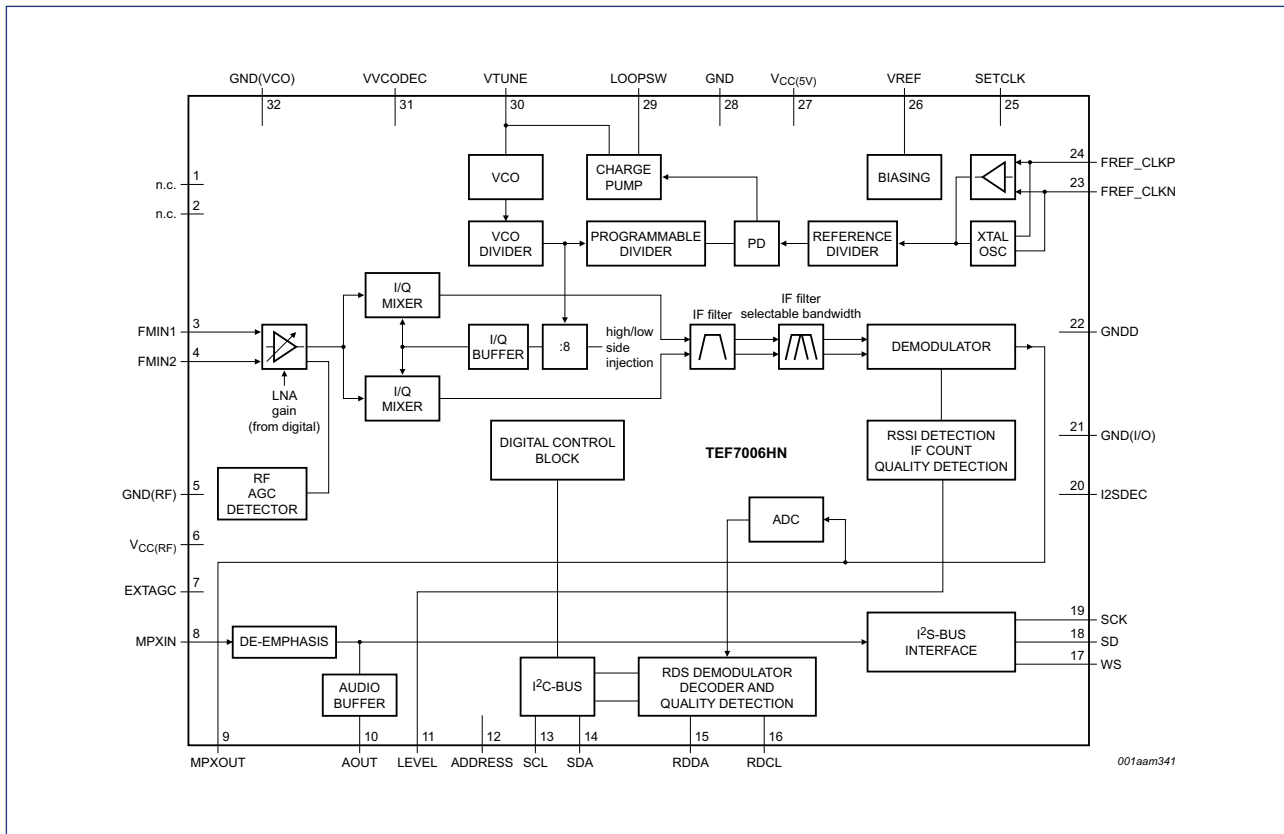
All functions are controlled using the Fast-mode I²C-bus up to 400 kHz. The I²C-bus also provides access to all weak signal detectors and other status information.

The two devices are pin-compatible and available in a thin HVQFN plastic quad flat package with 32 terminals (no leads, pitch 0.5 mm) and a body size of 5 x 5 x 0.85 mm. The complete application can be supported by a small, low-cost, dual-layer PCB.

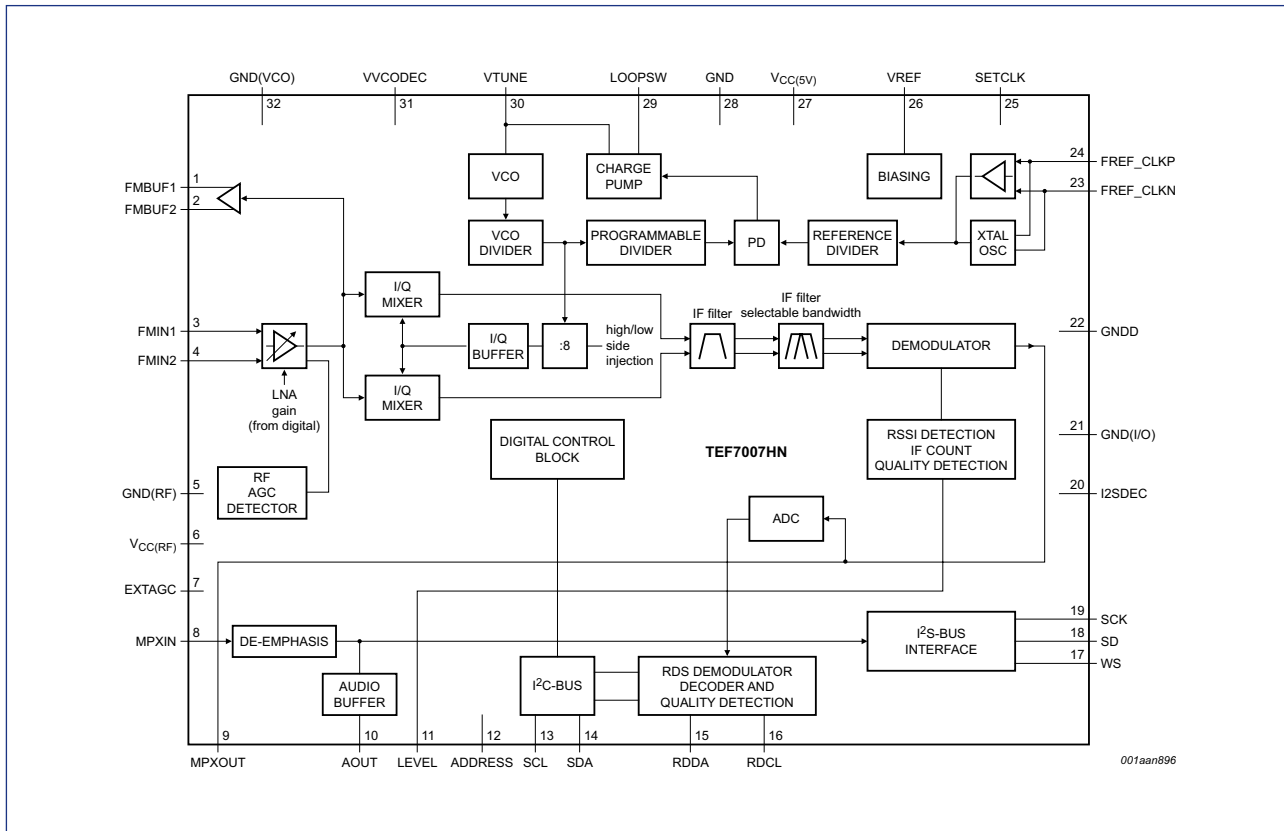
TEF7006 and TEF7007 pinning



TEF7006 block diagram



TEF7007 block diagram



TEF7006/TEF7007 package

