IP1012

ADVANCE INFORMATION

General Description

The TChip IP1012 is a base-band processor IP (intellectual property) module for GPS C/A-code applications. It implements the correlation channels, timing generation, base-band control and a microprocessor asynchronous interface. Up to 16 tracking modules are supported. Each module may be configured for acquisition, tracking or disabled individually. Data I/O to the base-band registers is compatible with most 16 or 32 bit microprocessors. Signalling is implemented with an interrupt whose period can be set between 100μs and 990μs.

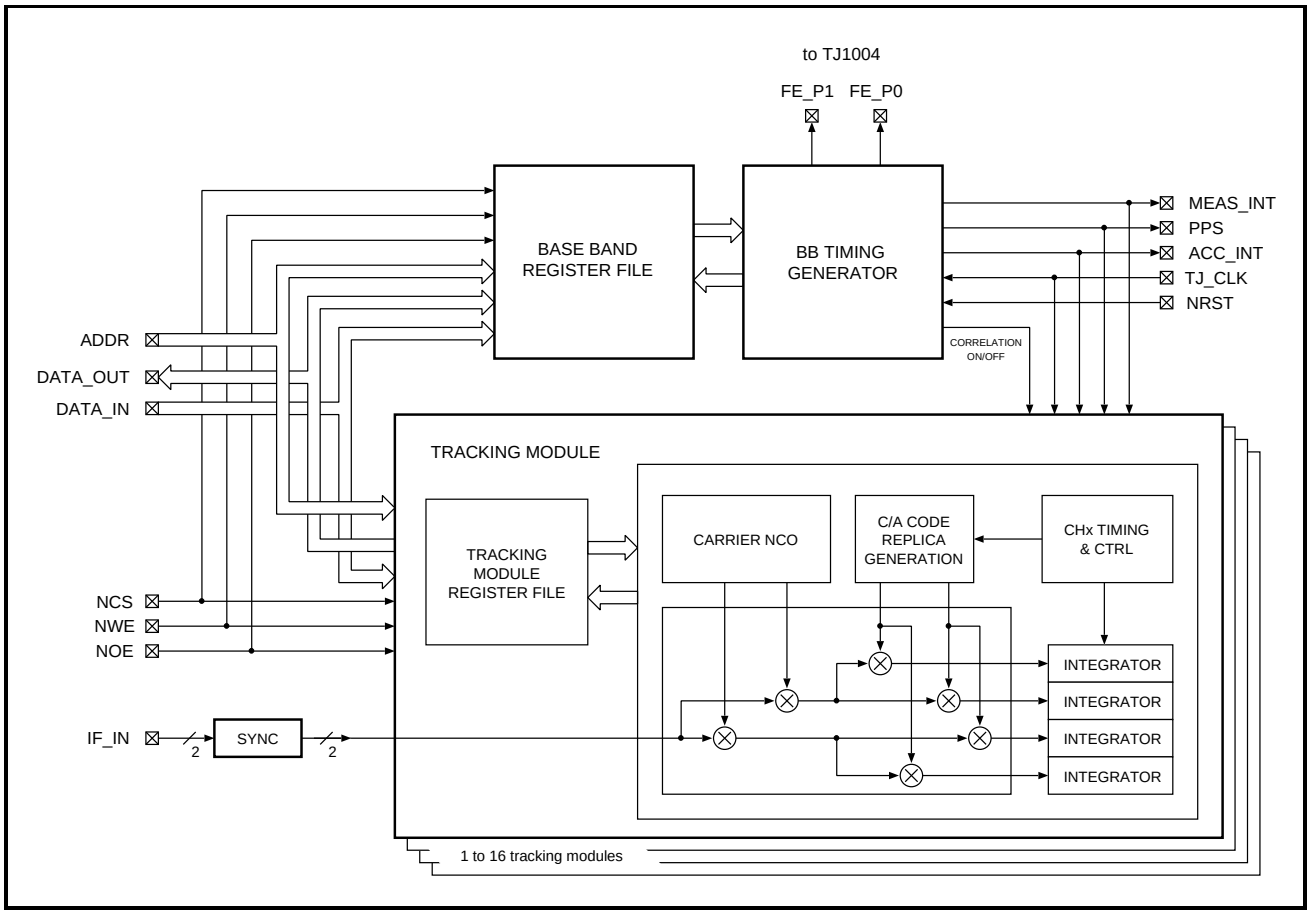
Each channel delivers I and Q correlated data as well as integrated carrier phase, GPS epochs, C/A-code phase, code and carrier NCO phase measurements. The measurements period can be set between 1ms and 65s, controlled by an interrupt signal which can be aligned to the GPS time to deliver 1PPS aligned measurements. The IP1012 interfaces directly to TChip TJ1004 GPS RF front-end. Other down-converters with 1 or 2 bit digital output can also be used. Two low power modes can be used depending on the conditions of the received signals and the needs of the GPS application software while the base-band processor can be set in an idle state when not used.

Features

- Up to 16 tracking modules for the C/A-code
- 2 bit sign and magnitude input signal
- Clock frequency between 12.288MHz and 18.432MHz
- Asynchronous 16 bit processor interface
- User defined interrupt and measurement rate
- Optional 1PPS measurements alignment
- Shut-down, reduced duty-cycle and on/off modes
- Individual channel activation and control
- Direct support of the TJ1004 RF front-end low power modes

Applications

- Location-aware cellular phones
- Wristwatches, time references
- PDAs, handheld navigation systems
- Covert GPS receivers
- Asset tracking
- Power-sensitive, battery operated GPS receivers



Low Power Operating Modes

Low Power Mode 1

In this operating mode the correlation is halted in all the active channels of the base-band for a portion of the 1 ms C/A code duration. During the correlation freeze time an external signal is generated which can be used to deactivate the signal path in the GPS front-end chip[1]. The size of the deactivation window can be adjusted from 0% to 100% of the C/A code period.

The Low Power Mode 1 can be used when the S/N ratios of the tracked satellites are particularly good. Once the deactivation window is set by the GPS software, full GPS operation with reduced power consumption is executed transparently to the GPS application.

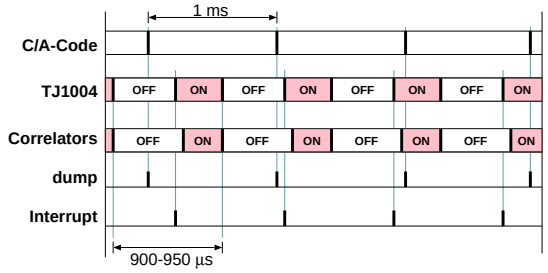


Figure 1: Low Power Mode 1

Low Power Mode 2

This low power mode exploits the fact that a navigation data bit is repeated 20 times in the GPS signal. Thus correlation can be halted for a large portion of the 20ms period, when this redundancy is not needed. If the deactivation window is kept below 20ms, full GPS operation can still be implemented by the GPS software. The deactivation window can be extended above 20ms in which case no navigation message can be acquired. Positioning can still be carried out by the GPS software on the basis of a stored navigation message.

The use of the Low Power Mode 2 is conditioned by the S/N ratio of the tracked satellites as well by the impact of the Doppler effect on the received signals. During the deactivation period an external signal is generated which can be used to put the GPS front-end chip in a power off mode where only the clock is provided [2].

Channel Deactivation

All tracking modules can be shut down individually. This allows for power saving when some of the tracking modules are not needed (eg. after acquisition of the satellites).

Note 1: Directly supported by the TJ1004 stand-by mode
Note 2: Directly supported by the TJ1004 doze mode