SV-3100 Radial Clock Card

Summary

The SV-3100 Radial Clock Card (RCC), developed in alignment with the Sensor Open Systems Architecture® (SOSA®) Technical Standard, is a grandmaster timing card capable of distributing and ingesting frequency and timing reference signals, as well as Position, Navigation and Time (PNT) data, from within a SOSA chassis or from external sensors. The RCC produces coherent timing signals that the cards within a single SOSA chassis over the P1 and P2 apertures can use. The RCC can use various PNT messages encoded in All Source Position and Navigation (ASPN) format to steer to or translate data between a variety of PNT devices. The RCC leverages the positioning, navigation and timing Operating System (pntOS) framework, which allows users to access an extensive library of both proprietary and open-source steering algorithms or even develop their own solutions that best fit their needs. The RCC also acts as a Precision Time Protocol (PTP) grandmaster and Network Timing Protocol (NTP) server.

Key Features

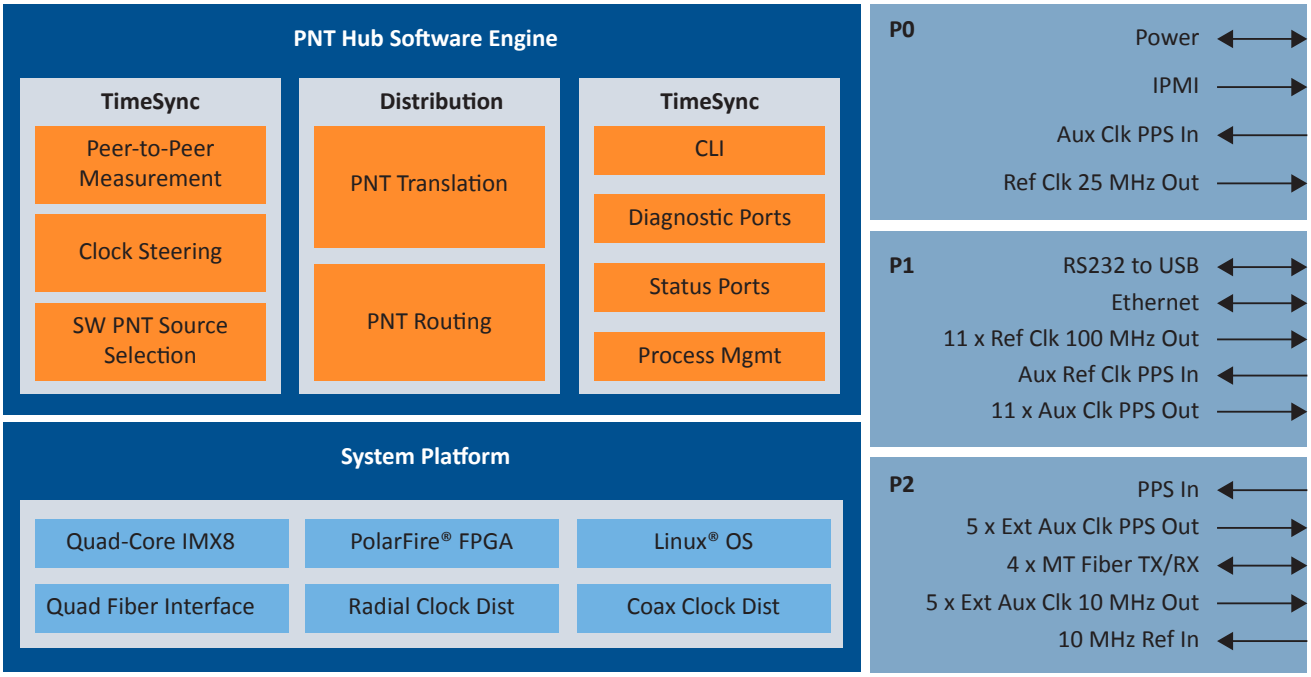
- SOSA aligned
- 3U VPX radial clock slot card
- Quad-core Arm® Cortex® processor with embedded Linux® operating system
- PolarFire® FPGA
- External PNT reference inputs
- pntOS INS software

Timing Distribution

- IEEE 1588 PTP grandmaster
- NTP server
- 11 radial clock outputs
- P2 aperture coaxial clock distribution
- P2 aperture, four-channel fiber optic interconnect synchronizing multiple chassis or external systems

Future-Proofing PNT System Designs

The SV-3100 is a PNT hub for the distribution of PNT data and the consumption and fusion of PNT sources. The radial clock card pairs well with our SV-3200 PNT source payload card, which hosts PNT sources such as M-Code receivers, atomic clocks and Inertial Measurement Units (IMUs). By separating the PNT sources from the distribution and fusion of PNT data, a system can operate in a true modular fashion, where future PNT sources, like next-generation atomic clocks and ALTNAV sensors, can be quickly incorporated onto a payload card without the need to re-spin the radial clock card hardware. PNT sources can be easily inserted into a chassis or sensor system based on the mission's requirements rather than trying to squeeze all the sources onto a single card.



TimeSync Software Stack

The TimeSync software stack includes peer-to-peer measurement algorithms, clock steering algorithms and a software-defined PNT source selector. The timing card performs clock offset measurements between reference clocks, internal and external to the chassis, with picosecond-level accuracy. The timing card can then steer to different clock sources depending on the availability of such resources. Clock input selection is software controlled to enable hitless switching between references. The TimeSync app enables the SV-3100 to act as a true timing hub by measuring and steering external and internal timing sources, including oscillators, atomic clocks and GPS or GNSS receivers.

PNT Routing and Distribution

PNT data measurements are timestamped by the SV-3100 using the local time base of the chassis and wrapped in the ASPN2023 messaging format. The timestamped measurements can be locally used in a pntOS fusion algorithm or can be routed to an external chassis or system for remote use. The routing and translation of PNT data is achieved on the software plane and is independent of the physical transport plane, making the SV-3100 a true software-defined PNT distribution and fusion hub.

Management

The Management function enables a user to configure many of the different settings on the timing cards, such as the IEEE 1588 PTP profile settings or the primary reference timing source. The management interface also provides the user status and diagnostic information about the current performance and function of the card.

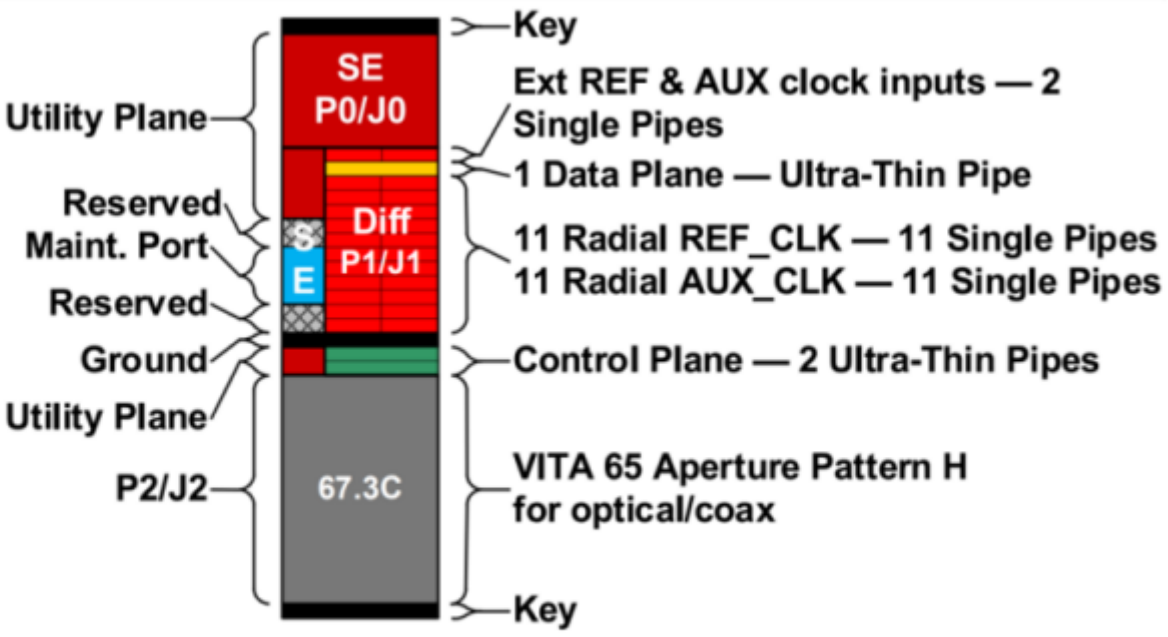
Radial Clock Function

The SV-3100 operates as a classic RCC, distributing radial clock signals over the P1 aperture and 1 PPS/10 MHz outputs over the P2 aperture. The SV-3100 can also act as a PTP grandmaster and NTP server, providing precise time over a network.

Fiber Interface

The SV-3100 has a four-channel fiber optic interface on the P2 aperture that can be used for the precise transfer of PNT information between external chassis or systems. A single SV-3100 can connect to four external chassis or systems. PNT data can be shared over the fiber interface, allowing a network of chassis to operate in a decentralized manner. The fiber interface also enables a chassis to take advantage of all available resources on a platform, or for several chassis operating on the same platform to share PNT resources between system, which improves the resilience of the platform.

Timing Card Slot Profile and P2 Connector Layout



"Technical Standard for SOSA™ Reference Architecture, Edition 2.0 (Snapshot 2)" by The Open Group

Part Number	Description
SV-3100-C00	Radial Clock Card, PTP Grandmaster, PNT Distribution Hub